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<th>S.No.</th>
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<th>Sub.Code</th>
<th>Subject Name</th>
<th>Periods/week</th>
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Note: L = Lectures, T = Tutorials, P = Practical, TA = Theory Assignments, FE = Final Exams, SE = Seminar Exams, T.C.A. = Theory Component Assessment, ESE = End Semester Exam.
## Elective III & VI

<table>
<thead>
<tr>
<th>Sr.No.</th>
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<tr>
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<td>Digital image processing</td>
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<td>2</td>
<td>IT 704</td>
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<td>IT 705</td>
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<td>IT 706</td>
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<td>IT 709</td>
<td>Distributed System &amp; Parallel Processing</td>
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<td>8</td>
<td>IT 710</td>
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<tr>
<td>9</td>
<td>IT 711</td>
<td>Computational Intelligence</td>
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**Note:** For attendance of a student in every theory and practical class, the teachers are supposed to keep records ultimately in the following format which will be included in the semester mark-sheets.

**T.C.A. = Total of Continuous Assessment**

<table>
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<tr>
<td>&lt; 60</td>
<td>Poor &quot;P&quot;</td>
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</tbody>
</table>
UNIT - I: MANAGEMENT & ORGANIZATIONAL SUPPORT SYSTEMS FOR DIGITAL FIRM
Definition of MIS; Systems approach to MIS: MIS and Human factor considerations, concept of organizational information sub-system, MIS & problem solving. Information Technology Infrastructure for digital firm. Related Case Studies.

UNIT - II: INFORMATION SYSTEMS & BUSINESS STRATEGY

UNIT - III: INFORMATION SYSTEMS IN THE ENTERPRISE

UNIT - IV: INFORMATION TECHNOLOGY FOR COMPETITIVE ADVANTAGE:
Firm in its environment, the information resources, who manages the information resources? Strategic planning for information resources. End-User Computing as a strategic issue, Information resource management concept. Knowledge management & their work system, Business value of information system Related Case Studies.

UNIT - V: INTERNATIONAL INFORMATION SYSTEM:

Name of Text Books:
1. MIS managing the digital firm, Kenneth C. Laudon & Jane P. Laudon (Pearson Education).
2. MIS, Suresh K. Basandra (Wheelers).

Name of Reference Books:
1. Introduction to computer Information System for Business, Mark G. Simkin. S. Chand & Co., 1996.
3. Analysis and Design of information system, V.Rajaraman(PHI)
UNIT-I: GENERAL ISSUES AND OVERVIEW OF AI
The AI problems; what is an AI technique; Level of model, criteria for success, Characteristics of AI applications, Problem Solving, State Space Search, Production systems, Control strategies: forward and backward chaining. Problem characteristics, Production System characteristics, issues in the design of search program, Data driven and goal driven search, Exhaustive searches: Depth first & Breadth first search.

UNIT-II: HEURISTIC SEARCH TECHNIQUES
Heuristics & Heuristic function, Heuristic Search – Generate & test, Hill climbing; Branch and Bound technique; Best first search & A* algorithm; AND, OR Graphs; Problem reduction and AO* algorithm; Constraint Satisfaction problems, Means End Analysis.

UNIT-III: KNOWLEDGE REPRESENTATION
Introduction to knowledge representation-Propositional calculus, First Order Predicate Calculus, conversion to clause form, Unification, Theorem proving by Resolution, Natural Deduction, Inference Mechanisms Horn’s Clauses; Knowledge representation issues-Representation and mapping, Approaches to Knowledge representation, Frame Problem, Structured knowledge representation-Semantic Networks Frame representation and Value Inheritance; Conceptual Dependency and Scripts. Introduction to Agent based problem solving.

UNIT-IV: REASONING UNDER UNCERTAINTY & APPLICATIONS OF AI
Source of Uncertainty, Probabilistic Reasoning and Uncertainty; Probability theory; Bayes Theorem and Bayesian networks, Certainty Factor, Dempster-Shafer theory, Non Monotonic Reasoning, Truth maintenance Systems, Overview of Fuzzy Logic.
Natural language processing: overview, Basic steps followed for the NLP, concept of NLP, Parsing, machine translation, Planning Overview - An Example Domain: The Blocks Word; Component of Planning Systems; Goal Stack Planning (linear planning); Non-linear Planning using constraint posting. Learning, Rote Learning; Learning by Induction, Learning in Problem Solving, Explanation based learning and Discovery.

UNIT-V: GAME PLAYING, AI LANGUAGES & EXPERT SYSTEMS
Name of Text Books:
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems- Prentice Hall of India.

Name of Reference Books:
“Digital Image Processing”

Unit I: Introduction

Image formation model, Spatial & Gray level resolution, Image enhancement in special domain: Piecewise transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters- smoothing and sharpening, Laplacian filter, Canny edge detector.

Unit II: Image enhancement in frequency domain & Image Segmentation

2D discrete fourier transform & its inverse, filtering in frequency domain, Ideal & Gaussian low pass filters, High pass filtering, FFT, Line detection, Edge detection, Edge linking & boundary detection, Thresholding, Region based segmentation.

Unit III: Morphological Image Processing

Logic operations involving binary image, Dialation & Erosion, Opening & Closing, Applications to Boundary extraction, region filling, connected component extraction.

Unit IV: Image Compression:

Coding redundancy- Huffman coding, LZW coding, run length coding, Lossy compression- DCT, JPEG, MPEG, video compression.

Unit V: Image Representation & 3D:

Boundary descriptors, Shape numbers, Texture, Projective geometry, Correlation based and feature based stereo correspondence, shape from motion, optical flow.

Name of Text Books:
2. Sonka and Brooks, Image Processing, TSP ltd.

Name of Reference Books:
1. Jain and Rangachar, Machine Vision, MGH.
“Advanced Computer Architecture”

Theory Periods: 30 Tutorials: “10”
Credits: 4 Code: IT 704

Unit - I: Introduction
Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn’s & Feng’s Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.

Unit – II: Pipelining and Memory Hierarchy
Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

Unit – III: Thread and Process Level Parallel Architecture
Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

Unit – IV: Parallel Algorithms
PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

Unit – V: Developing Parallel Computing Applications
OpenMP Implementation in ‘C’: Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in ‘C’. Basics of MPI.

Name of Text Books:
5. Quinn, “Parallel Computing: Theory & Practice“, TMH.
6. Quinn, “Parallel Programming in C with MPI and Open MP”, TMH Open MP Specification and Usage
UNIT - I

Fundamental Concepts: Definitions of fault tolerance, fault classification, fault tolerant attributes and system structure.

Fault-Tolerant Design Techniques: Information redundancy, hardware redundancy, and time redundancy.

UNIT-II

Dependability Evaluation Techniques: Reliability and availability models: (Combinatorial techniques, Fault-Tree models, Markov models), Performability Models.


UNIT - III

Software Fault Tolerance: Software faults and their manifestation, design techniques, reliability models.

UNIT - IV

Fault Tolerant Parallel/Distributed Architectures: Shared bus and shared memory architectures, fault tolerant networks.

UNIT - V

Recent topics in fault tolerant systems: Security, fault tolerance in wireless/mobile networks and Internet.

Name of Text Books:

Unit-I
Strategic, tactical and operational. Consideration of organizational structures. Mapping of databases, MIS, EIS, KBS, expert systems, OR modeling systems and simulation, decision analytic systems onto activities within an organization. Extension to other 'non organizational' areas of decision making. Relationship with knowledge management systems.

Unit-II
Studies of human cognition in relation to decision making and the assimilation of information. Cultural issues. Implications for design of decision-making support. Communication issues.

Unit-III
Normative, descriptive and prescriptive analysis: requisite modeling. Contrast with recognition primed decision tools.

Unit-IV
Database, MIS, EIS, KBS, Belief nets, data mining. OR modeling tools: simulation and optimization. History, design, implementation: benefits and pitfalls. Risk assessment, Decision analysis and strategic decision support.

Unit-V
Group decision support systems and decision conferencing. Intelligent decision support systems: tools and applications. Cutting-edge decision support technologies. History, design, implementation: benefits and pitfalls. Deliberative e-democracy and e-participation.

Name of Text Books:

Name of Reference Books:
2. V.S.Janakiraman and K.Sarucesi, Decision Support Systems, PHI
“Natural Language Processing”

Theory Periods: 30  
Credits: 4  
Tutorials: “10”  
Code: IT 707

Unit - I

Introduction to Natural Language Processing, Different Levels of language analysis, Representation and understanding, Linguistic background.

Unit - II

Grammars and parsing, Top down and Bottom up parsers, Transition Network Grammars, Feature systems and augmented grammars, Morphological analysis and the lexicon, Parsing with features, Augmented Transition Networks.

Unit - III

Grammars for natural language, Movement phenomenon in language, Handling questions in context free grammars, Hold mechanisms in ATNs, Gap threading, Human preferences in parsing, Shift reduce parsers, Deterministic parsers, Statistical methods for Ambiguity resolution

Unit - IV

Semantic Interpretation, word senses and ambiguity, Basic logical form language, Encoding ambiguity in logical form, Thematic roles, Linking syntax and semantics, Recent trends in NLP.

Unit – V


Name of Text Books:
2. D Juraffsky, J H Martin, Speech and Language Processing, Pearson Education.
Unit- I


Unit- II

Robot Programming – methods – interlocks textual languages – characteristics of robot level languages, characteristics of task level languages

Unit- III


Unit- IV

Robot cell design and control – Remote centre compliance – safety in robotics.

Unit- V

Advanced robotics, advanced robotics in space – specific features of space robotics systems – long term technical developments – advanced robotics in underwater operations, Robotics technology for the future – future applications

Name of Text Books:

Reference Books
UNIT I

UNIT II
Distributed Mutual Exclusion, Mutual Exclusion in single computer system Vs Distributed, Concept of Critical Section, Non Token-based algorithm- Central Coordinator Algorithm, Lamport’s Algorithm, Ricart-Agrawala Algorithm, Maekawa’s Algorithm, Token based algorithm- Token Ring Algorithm, Suzuki-kasami’s Broadcast Algorithm, Singhal’s Heuristic Algorithm, Raymonds Tree based Algorithm.

UNIT III
Distributed deadlock detection: Control organization- Centralized Vs Distributed, Completely centralized, The Ho-Ramamoorthy, one-phase algorithm, Distributed- path pushing, edge chasing, Diffusion computation based, Global state detection based algorithm, Hierarchical – The Menasce-Muntz Algorithm, The Ho-Ramamoorthy Algorithm, Deadlock Resolution.

UNIT IV

UNIT V
Algorithm for parallel machine- Parallel Algorithm Introduction, Models of Parallel Computation, Parallel Prefix Computation, Parallel Merging, Parallel Searching, Parallel Sorting, Matrix Multiplication.

Name of Text Books:
2. Tanenbaum, “Distributed Systems,” PHI.
UNIT-I INTRODUCTION

Introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces - error probabilities and integrals - normal density - discriminant functions for normal density

UNIT-II ESTIMATION AND LEARNING

Parameter estimation and supervised learning - maximum likelihood estimation - the Bayes classifier - learning the mean of a normal density - general bayesian learning - nonparametric technic - density estimation - parzen windows - k-nearest neighbour estimation - estimation of posterior probabilities - nearest - neighbour rule - k-nearest neighbour rule

UNIT-III FUNCTIONS

Linear discriminant functions - linear discriminant functions and decision surfaces - generalized linear discriminant functions - 2-category linearly separable case - non-separable behavior.

UNIT-IV PROGRAMMING PROCEDURES

Linear programming procedures - clustering - data description and clustering - similarity measures - criterion functions for clustering

UNIT-V GRAMMAR AND LANGUAGE

Syntactic approach to PR - introduction to pattern grammars and languages - higher dimensional grammars - tree, graph, web, plex, and shape grammars - stochastic grammars - attribute grammars - parsing techniques - grammatical inference

Name of Text Books:
1. Duda & Hart P.E, Pattern Classification And Scene Analysis, John Wiley and Sons, NY

Name of Reference Books:
2. Fu K.S., Syntactic Pattern Recognition And Applications, Prentice Hall, Englewood cliffs, N.J.
“Computational Intelligence”

Theory Periods: 30
Credits: 4
Tutorials: “10”
Code: IT 711

UNIT-I
Artificial Intelligence: History and Applications, Production Systems, Structures and Strategies for state space search- Data driven and goal driven search, Depth First and Breadth First Search, DFS with Iterative Deepening, Heuristic Search- Best First Search, A* Algorithm, AO* Algorithm, Constraint Satisfaction, Using heuristics in games- Minimax Search, Alpha Beta Procedure.

UNIT-II
Knowledge representation - Propositional calculus, Predicate Calculus, Theorem proving by Resolution, Answer Extraction, AI Representational Schemes- Semantic Nets,

UNIT-III
Conceptual Dependency, Scripts, Frames, Introduction to Agent based problem solving. Machine Learning- Symbol based and Connectionist, Social and Emergent models of learning,

UNIT-IV

UNIT-V
Languages and Programming Techniques for AI- Introduction to PROLOG and LISP, Search strategies and Logic Programming in LISP, Production System examples in PROLOG.

Name of Text Books:

Name of Reference Books:
1. E. Rich, K.Knight, Artificial Intelligence, 2/e, Tata McGraw Hill
3. Winston. P. H, LISP, Addison Wesley
4. Ivan Bratko, Prolog Programming for Artificial Intelligence, 3/e, Addison Wesley, 2000
### Artificial Intelligence & Expert Systems Lab

**Semester:** VII  
**Code:** IT 791  
**Subject:** Artificial Intelligence & Expert Systems Lab  
**Credits:** 2

List of 10-15 Assignment/Practical will be allotted by the Instructor in the respective Lab.

### Management Information System Lab

**Semester:** VII  
**Code:** IT 792  
**Subject:** Management Information System Lab  
**Credits:** 2

List of 10-15 Assignment/Practical will be allotted by the Instructor in the respective Lab.

### Practical Training

**Semester:** VII  
**Code:** IT 793  
**Subject:** Practical Training  
**Credits:** 2

### Minor Project

**Semester:** VII  
**Code:** IT 794  
**Subject:** Minor Project  
**Credits:** 6

### Seminar and Report Writing

**Semester:** VII  
**Code:** IT 795  
**Subject:** Seminar and Report Writing  
**Credits:** 1