GURU KASHI UNIVERSITY

B. Voc.in – Artificial Intelligence & Machine Learning

Session: 2024-25

Department of Computer Science & Engineering

Semester: III						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
BMA301	Discrete Mathematics	Core	4	0	0	4
BMA302	Operating System	Core	4	0	0	4
BMA303	Design & Analysis of Algorithms	Core	4	0	0	4
BMA304	Computer Organization & Architecture	Core	4	0	0	4
BMA305	Operating System Lab	Skill based	0	0	4	2
BMA306	Design & Analysis of Algorithms Lab	Skill based	0	0	4	2
Open Elective –I						
xxx		Open Elective Course	2	0	0	2
Discipline Elective-I(Any one of the following)						
BMA307	Multimedia and Applications	Discipline Elective- I	**3**	**0**	**0**	**3**
BMA308	Cloud Computing					
Total			**21**	**0**	**10**	**25**
Open Elective – I(Open Elective Courses for other Departments)						
BMA309	Introduction to Artificial Intelligence & Machine Learning	Open Elective Course	2	0	0	2

Course Title: DISCRETE MATHEMATICS

Course Code: BMA301

L	T	P	Credits
4	0	0	4

Semester: III

Total Hours-60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Use mathematically correct terminology and notations
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Analysis the counter examples.

Course Content

UNIT I **15 Hours**

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

UNIT II **15 Hours**

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination. Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT III **15 Hours**

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi-Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with

two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.

UNIT IV **15 Hours**

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Aurelian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Coloring Vertices, Coloring Edges, List Coloring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi- connected component and Articulation Points, Shortest distances.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning **Suggested Readings**

- *J.P. Tremblay and R. Manohar. (1997). Discrete Mathematical Structure and Its Application to Computer Science". TMG Edition,Tatamcgraw-Hill.*
- *Norman L. Biggs. (2010). Discrete Mathematics. 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, MarcLipson.*
- *Mott, Abraham Kandel. (2011). Discrete Mathematic. TataMcGraw-Hill.*

Course Title: OPERATING SYSTEM

Course Code: BMA302

L	T	P	Credits
4	0	0	4

Total Hours-60 Learning

Outcomes: After completion of this course, the learner will be able to:

1. Design the algorithms to write programs.
2. Understand the concept of arrays, pointers and structures to formulate algorithms and programs
3. Apply programming to solve simple numerical method problems, namely rot finding
4. Describe the Function, differentiation of function and simple integration

Course Content

UNIT I **15 Hours**

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

UNIT II **15 Hours**

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problematic.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock Recovery

UNIT III **15 Hours**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation– Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation –Hardware support for paging, Protection and sharing, Disadvantages of paging. Failures and recovery management.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT IV **15 Hours**

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning **Suggested Readings**

- *Charles Crowley. (1996). Operating System; A Design-oriented Approach. 1st Edition, Irwin Publishing.*
- *Gary J.Nutt, Addison. (2002). Operating Systems: A Modern Perspective. 2nd Edition Wesley.*
- *Maurice Bach, Prentice-Hall of India (1986). Design of the Unix Operation Systems. 8th Edition.*
- *Daniel P. Bovet, Marco Cesati, O'Reilly and Associates. (2005). Understanding the Linux Kernel. 3rd Edition*
- *Waddington, D. G., and D. Hutchison. (1999): "Resource partitioning in general purpose operating systems." ACM SIGOPS Operating Systems Review 33, no. 4*
- *Abraham Silberschatz,(2021) Peter Baer Galvin, Greg Gagne, "Operating System Principles", 10th edition.*

Web Links

- *https://www.techtarget.com/whatis/definition/operating-system*
- *https://www.coursera.org/courses?query= operating system*
- *https://www.cse.iitb.ac.in/~mythili- operating-system*
- *https://computer.howstuffworks.com/web-operating-system.htm*

Course Title: DESIGN & ANALYSIS OF ALGORITHMS

Course Code: BMA303

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe the greedy paradigm and develop the greedy algorithms.
2. Implement and examine the divide-and-conquer paradigm.
3. Develop the dynamic programming algorithms and evaluate their computational complexity.
4. Analysis the graphs to find shortest path.

Course Content

UNIT I **15 Hours**

Introduction: Algorithm and its importance, Mathematical foundations- Growth functions, Complexity analysis of algorithms.

Divide and Conquer: Basic technique and its application on Binary Search, Finding Maximum and Minimum and on sorting techniques such as Merge Sort, Quick Sort.

UNIT II **15 Hours**

Greedy Algorithms: General method, using greedy algorithm to solve Knapsack problem, Minimum-Cost spanning trees problem, Single source shortest path problem and Travelling salesperson problem.

Dynamic Programming: Introduction to dynamic programming and application of the algorithm to solve multistage graphs, all pair's shortest path problem and Knapsack problem.

UNIT III **14 Hours**

Backtracking: General backtracking algorithm, Application of backtracking to 8 Queens' problem, Sum of subsets, Graph coloring, Hamiltonian cycles and Knapsack problem.

String Matching Algorithms: Introduction, Brute Force algorithm, Rabin-Karp algorithm, KMP algorithm, and Boyer-Moore algorithm.

UNIT IV **16 Hours**

NP-completeness and Approximation Algorithms: Introduction to P, NP, NP-hard and Complete problems, Examples of NP-complete problems, Introduction to approximation algorithms, Absolute approximations, E-approximations . **Approximation algorithms using linear programming, randomization, and specialized techniques**.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning **Suggested Readings**

- *Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms" Galgotia Publications (Year 2002).*
- *Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, and Clifford Stein, "Introduction to Algorithms", MIT Press Year 1990.*
- *Sanjoy Dasgupta, Christos Papadimitriou, and Umesh Vazirani, "Algorithms", McGraw-Hill Education 2006.*
- *Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Wiley (Year 2002).*
- *Alfred V. Aho, John E. Hopcroft, and Jeffrey. D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education 1974. 6. John Kleinberg and Eva Tardos, "Algorithm Design", Pearson Education 2005.*
- *T. H. CORMEN, C. E. LEISERSON, R. L. RIVEST, AND C. STEIN. Introduction to Algorithms, MIT Press, New York, 3rd edition, 2009.*
- *S. DASGUPTA, C. PAPADIMITRIOU, AND U. VAZIRANI. Algorithms, McGraw-Hill, New York, 2008*

Web Links

- *https://www.classcentral.com/course/swayam-Design-and-analysis-of- algorithms-*
- *https://vssut.ac.in/lecture_notes/lecture1428551222. Design-and-analysis-of-algorithms-*
- *https://sites.northwestern.edu/hartline/eecs-336-Design-analysis-of-algorithms.*

Course Title: Computer Organization & Architecture

Course Code: BMA304

L	T	P	Credits
4	0	0	4

Total Hours-60 Learning

Outcomes: After completion of this course, the learner will be able to:

1. Understand the basic concept of computer fundamentals, Number system, Boolean algebra, Karnaugh map and Perform problems
2. Explain the concept of stored program, role of operating system, Instruction sets and Addressing modes and Demonstrate problems on Addressing modes.
3. Use of control unit and various I/O operations
4. Classify the concept of Instruction pipeline, RISC, CISC

Course Content

UNIT I **15 Hours**

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL0interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common cpus.

Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. Multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT II **15 Hour**

Introduction to x86 architecture: CPU control unit design: hardwired and micro- program design approaches, Case study – design of a simple hypothetical CPU. **Memory system design:** semiconductor memory technologies, memory organization. **Peripheral devices and their characteristics:** Input-output subsystems, I/O device interface, I/O transfers-program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, US

UNIT III **14 Hours**

Pipelining: Basic concepts of pipelining, through put and speedup, pipeline hazards. **Parallel Processors:** Introduction to parallel-processors, Concurrent access to Memory and cache coherency.

UNIT IV **16 Hours**

Memory organization: Memory interleaving, concept of hierarchical memory

organization, cache memory, cache size vs. Block size, mapping functions, replacement algorithms, write policies.

Transaction Modes Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *John P. Hayes. (1988). Computer Architecture and Organization. 3rd Edition, WCB/McGraw- Hill.*
- *William Stallings. (2016). Computer Organization and Architecture. Designing for Performance. 10th Edition, Pearson Education.*
- *Vincent P. Heuring and Harry F. Jordan. (2004). Computer System Design and Architecture, 2nd Edition by Pearson Education.*

Course Title: OPERATING SYSTEM LAB

Course Code: BMA305

L	T	P	Credits
0	0	4	2

Total Hours-30 Learning

Outcomes: After completion of this course, the learner will be able to:

1. Acquire the knowledge of Linux operating system.
2. Develop and debug the various Linux commands.
3. Perform various shell commands.
4. Discuss shell programming & its concepts.

Course Content

Installation Process of various operating systems

1. **Commands for files & directories:** cd, ls, cp, md, rm, mkdir, rmdir. Creating and viewing files using cat. File comparisons. Disk related commands: checking disk free spaces. Processes in Linux, connecting processes with pipes, background processing, managing multiple processes. Manual help. Background process: changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep. Printing commands, grep, fgrep, find, sort, Cal, banner, touch, file. File related commands ws, sat, cut, grep.
2. **Administrative commands:** ACCEPT DATE, LIBVOLUME, EXPORT commands, IMPORT commands, LOCK commands, MOVE commands, QUERY commands, REGISTER commands, ACTIVATE POLICYSET (Activate a new policy set), ASSIGN DEFMGMTCLASS)AUDIT commands, LDAPDIRECTORY, BACKUP commands ,
   BEGIN EVENTLOGGING (Begin logging events), CANCEL commands, CHECKIN LIBVOLUME (Check a storage volume into a library), CHECKOUT LIBVOLUME (Check a storage volume out of a library), CLEAN DRIVE (Clean a drive), COMMIT (Control committing of commands in a macro), COPY commands, DEFINE commands, DELETE commands, DISABLE commands, DISMOUNT command, DISPLAY OBJNAME (Display a full object name), ENABLE commands, EXPORT commands, IMPORT commands, LOCK commands, MOVE commands, QUERY commands, REGISTER commands,
   PERFORM LIBACTION, PING SERVER, QUERY ,QUIT, RECLAIM STGPOOL, RECONCILE VOLUMES, REGISTER, REMOVE commands, RENAME commands, REPLICATE NODE, REPLY, RESET PASSEXP, PASSEXP, RESET , RESTART EXPORT, RESTORE commands, MACRO, MIGRATE STGPOOL, REVOKE
   commands, ROLLBACK, RUN, SET commands,
   SELECT, SETOPT, SHRED DATA (Shred data), SETOPT, SUSPEND EXPORT
   UNLOCK commands, UPDATE commands, VALIDATE commands, VARY, AUDIT commands, BACKUP commands, CANCEL commands, COPY commands.

3. **Shell Programming:** Basic of shell programming, various types of shell, Shell Programming in bash, conditional & looping statement, case Statement, parameter passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks, report printing.

Course Title: DESIGN & ANALYSIS OF ALGORITHMS LAB

Course Code: BMA306

L	T	P	Credits
0	0	4	2

Total Hours-30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Examine randomized algorithms.
2. Analyze the performance of algorithms.
3. Describe and implement the dynamic-programming paradigm.
4. Examine and recognize the greedy paradigm.

Course Content

1. Write a program to implement bubble sort algorithm by comparing its complexity.
2. Write a program to implement linear search algorithm by comparing it complexity.
3. Write a program to implement binary search algorithm by comparing its complexity.
4. Write a program to implement PUSH operation in stacks.
5. Write a program to implement POP operation in stacks.
6. Write a program to implement Queues.
7. Write a program to insert an element in the beginning of the link list.
8. Write a program to delete an element from the middle of the link list.
9. Write a program to implement the concept of queen's problem.

L	T	P	Credits
3	0	0	3

Course Title: Multimedia and Applications Course

Code: BMA307

Total Hours:45

Course Learning Outcome Outcomes: On successful completion of this course, the students will be able to:

1. Describe technical characteristics and performance of multimedia system and terminals.
2. Design creative approach in application of multimedia devices, equipment and systems
3. Interpret and analyze measurement results obtained on the multimedia system and components,
4. Describe the development process and applications of the multimedia systems
5. Carry out experiments and measurements on the multimedia systems in laboratory conditions on real components

Course Content

Unit-I **10Hours**

Introduction To Multimedia Technology - computers, communication and entertainment framework for multimedia system, features of multimedia system, Multimedia Hardware devices& software development tools, M/M devices, presentation devices and the user interface, M/M presentation and authoring.

Unit-II **15Hours**

Digital Representation Of Sound And Image:-Digital representation of sound and transmission, Basics of Video, ,Types of Video Signals, Analog Video, Digital Video, brief survey of speech recognition and generation, digital video and image compression, JPEG image compression standard, MPEG motion video compression, DVI technology, timbered media representation and delivery.

Unit-III **10Hours**

M/M Software:-M/M software environments, limitations of workstation operating systems, M/M system services, OS support for continuous media applications, media stream protocol, M/M file system and information representation system, and data models for M/M and hypermedia

information.

Application of M/M:-Application of M/M, intelligent M/M system.

Unit-IV **10Hours**

Virtual Reality System: Desktop VR, virtual reality OS, distributed virtual environment system, virtual environmental displays and orientation tracking, visually coupled systems requirements, intelligent VR software systems.

Multimedia Communication: Building Communication network, Application Subsystem, Transport Subsystem, QOS, Resource Management, Distributed Multimedia Systems.

Uses: Applications of environments in various fields such as medical entertainment, manufacturing, business, education etc.

Suggested Readings

1. **Stephen McGloughlim**, "Multimedia on the Web", PHI.
2. **Villamil-Casanova &Nolina**, "Multimedia production, planning & Delivery", PHI.
3. **Lozano,** "Multimedia sound & video", PHI.
4. **J. Jeefcoate,** "Multimedia in Practice Tech & application".

L	T	P	Cr
3	0	0	3

Course Title: Cloud Computing Course
Code: BMA308

Total Hours: 45

Course Learning Outcome: On successful completion of this course, the students will be able to:

1. Design Vision, Reference Model, Benefits, Limitations, Open Challenges, Grid and Utility Computing.
2. Demonstrate Service Models, Deployment Models, Cloud Entities, Cloud Clients, and Cloud Programming Models.
3. Describe Cloud Security: Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud
4. Resource Provisioning, Bill Management, Multitenancy and Isolation, Service Level Agreement (SLA) and Quality of Service (QoS)
5. Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud.

Course Content

UNIT-I **10 Hours**

Cloud Computing: Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of the
Cloud Computing, security concerns and regulatory issues, over view of different cloud computing applications which are implemented, Business case for implementing a Cloud.

UNIT-II **10 Hours**

Cloud computing and Service Models: Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as- a- Service (IaaS), Platform- and Software-as-a-Service (Paas, SaaS). Architectural Design of Compute and Storage Clouds: A Generic Cloud architecture Design, Layered Cloud Architectural development, Architectural Design Challenges. Cloud Standards: Applications, Client, Infrastructure, Services.

UNIT-III **10 Hours**

Cloud Computing Mechanisms: Software as a service: Overview, Driving Forces, Company offerings, Industries, Software services, Overview Mobile Device Integration, Providers, Microsoft Online Application development, Google, Microsoft, Intuit Quick base, Cast Iron Cloud, Bungee Connect, Development Platforms: Google, Sales Force, Azure, Trouble shooting, Application management

UNIT-IV **10 Hours**

Local Clouds: Virtualization, server solutions, Thin Clients

Migrating to the clouds: Cloud services for individuals, Mid-market, and Enterprise wide, Migration, best practices, analyzing the service.

Suggested Readings

1. Mastering Cloud Computing, RajkumarBuyya, Christian Vecchiola, and ThamaraiSelvi, Tata McGraw Hill, ISBN-13: 978-1-25-902995-0, New Delhi, India,Feb 2013.

2. Cloud Computing Bible, Barrie Sosinsky, Wiley India Pvt. Ltd, ISBN-13: 978- 81-265-2980-3, New Delhi, India, 2011.

3. Cloud Computing: Principles and paradigms, Raj Kumar Buyya, James Broberg, AndrezeiM.Goscinski, Wiley India Pvt. Ltd, ISBN-13: 978-81-265- 4125-6, New Delhi, India, 2011.

REFERENCE BOOKS:

1. Cloud Computing for Dummies, Fern Halper, Hurwitz, Robin Bloor, Marcia Kaufman, Wiley India Pvt. Ltd, ISBN-13: 978-0-47-0597422, New Delhi, India, 2011.

2. Dr. Saurabh Kumar, Cloud Computing: Insights into New-Era Infrastructure, Wiley India Pvt. Ltd, and ISBN-13: 978-8-12-6528837, New Delhi, India, 2011.

Course Title: INTRODUCTION TO ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Course Code: BMA309

L	T	P	Credits
2	0	0	2

Total Hours-30

Learning Outcomes: After completion of this course, the learner will be able to:

5. Design expert system by using AI tools.
6. Compare and develop expert system with the help of Neural Networks
7. Understand the concept of expert system using Machine Learning.
8. Create an expert system using Fuzzy Logic.

Course Content

UNIT I **10 Hours**

Introduction: What is AI, Importance of AI, Early work in AI, Applications of AI, Knowledge and its definition. Knowledge Representation: Prepositional logic, FOPL, Properties of Well-formed formulas, Conversion to Clausal form, Inference rules, Resolution principle.

Structured Knowledge: Introduction, Associate frame structures, Conceptual dependencies and scripts.

UNIT II **8 Hours**

Knowledge Organization and Manipulation: Concepts, Uninformed or Blind search, informed search, Searching- And-OR graphs, Pattern Recognition, Recognition Classification process, Classification patterns, Recognizing and understanding speech. **Generative AI**: How does generative AI work? Generative AI models, what are Dall-E, ChatGPT and Bard, use cases, benefits and its limitations, Ethics and bias, Generative AI vs. AI, Generative AI history.

UNIT III **6 Hours**

Planning: planning as search, partial order planning, construction and use of planning graphs. Decision-Making: basics of utility theory, decision theory, sequential decision problems, elementary game theory and sample applications.

UNIT IV **6 Hours**

Expert System: Definition, Rule based architecture, dealing with uncertainty, Knowledge acquisition and validation, knowledge system building tools.

Knowledge Acquisition: Types of learning, General Learning model, Performance measures. Learning nearest neighbor, naive Bayes, and decision tree classifiers.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- *Dan W. Patterson. (1990). Introduction to Artificial Intelligence and Expert Systems.PHI Publication.*
- *Peter Jackson. (1998). Introduction to Expert System. AddisonWesley.*