UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: **Teaching and Research Methodology** Subject Code- MCSE301
Year: 2ndYear Semester: Third

Module Number	Topics	Number of Lectures
1	**Instruction**	**2L**
	Introduction to content, Elements of instruction, Learning objectives,	1
	Roles of the teacher and the learner in instruction	1
2	**Teaching and Learning**	**4L**
	Application of theories of learning to teaching and learning, Sequence of learning and Strategies of learning,	2
	Teaching methods, their merits and demerits,	1
	Use of ICT in teaching & learning, Classroom management, Individual differences.	1
3.	**Planning for teaching and learning**	**3L**
	Understanding the syllabus, Preparation of a scheme of work,	2
	Lesson plan preparation, Micro teaching	1
4.	**Assessment and Evaluation**	**4L**
	Define measurement, assessment, test, evaluation, Purpose of assessment and evaluation,	2
	Types of tests, Grading and reporting the results assessment.	1
	Evaluating teaching and learning	1
5.	**Definition and explanation of research**	**4L**
	Types and Paradigms of Research, History and Philosophy of Research (esp. Philosophical evolution, pathways to major discoveries & inventions),	2
	Research Process decision, planning, conducting, Classification of Research Methods;	2
	Reflective Thinking, Scientific Thinking.	1
6.	**Research problem formulation:**	**11L**
	Literature review- need, objective, principles, sources, functions & its documentation,	2
	Problem formulation esp. sources, considerations & steps, Criteria of a good research problem, Defining and evaluating the research problem,	2
	Variables esp. types & conversion of concepts to variables. Research design esp. Causality, algorithmic, quantitative and qualitative designs,	2
	Various types of designs. Characteristics of a good	3

	research design, problems and issues in research design;	
	Hypotheses: Construction, testing, types, errors; Design of experiments especially classification of designs and types of errors.	2
7.	**Problem solving:**	**5L**
	Understanding the problem- unknowns, data & conditions, conditions - satisfiability, sufficiency, redundancy & contradiction,	1
	Separation of parts of the problem and conditions, notations; devising a plan- connection between data and unknown, similar/related problems, reuse of previous solutions, rephrasing/transforming the problem, solving partial or related problem,	2
	Transforming data and unknowns; carrying out the plan- esp. correctness of each step in multiple ways;	1
	Evaluation of solution and method- checking correctness of solution, different derivations, utility of the solution	1
8.	**Data & Reports:**	**5L**
	Infrastructural setups for research; Methods of data collection esp. validity and reliability, Sampling; Data processing and Visualization espicially Classification;	2
	Ethical issues espicially. bias, Misuse of statistical methods, Common fallacies in reasoning. Research Funding & Intellectual Property;	1
	Research reports: Research Proposal & Report writing esp. Study objectives, study design, problems and limitations;	1
	Prototype micro- project report implementing a major part of all the above (compulsory assignment)	1
Total Number Of Hours = 38		

Faculty In-Charge HOD, CSE Dept.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: Artificial Intelligence Subject Code-MCSE302A

Year: 4th Year Semester: Third

Module Number	Topics	Number of Lectures
1	**Introduction:**	**2L**
	Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.	
2	**Intelligent Agents**	**2L**
	Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.	
3	**Problem Solving**	**2L**
	Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.	
4	**Search techniques**	**5L**
	Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.	
5	**Heuristic search strategies**	**5L**
	Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems	
6	**Adversarial search**	**3L**
	Games, optimal decisions & strategies in games, the mini max search procedure, alpha-beta pruning, additional refinements, iterative deepening.	
7	**Knowledge & reasoning**	**3L**
	Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.	

8	**Using predicate logic**	**2L**
	Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.	
9	**Representing knowledge using rules**	**3L**
	Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.	
10	**Probabilistic reasoning**	**4L**
	Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.	
11	**Planning**	2L
	Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.	
12	**Natural Language processing**	**2L**
	Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.	
13	**Learning**	**2L**
	Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.	
14	**Expert Systems**	**2L**
	Representing and using domain knowledge, expert system shells, knowledge acquisition	
Total Number Of Hours = 39		

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UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: Artificial Intelligence Subject Code-MCSE302A
Year: 4th Year Semester: Third
Assignments:

Module-I: Introduction

1. What do you mean by Artificial intelligence?
2. Explain Tic - Tac - Toe problem.

Module-II: Intelligent Agents

1. Explain nature of environment
2. Discuss the followings:
    - structure of agents
    - goal based agents
    - utility based agents
    - Learning agents

Module-III: Problem Solving

1. Explain how the problem as state space search has defined?
2. Define problem characteristics and issues in the design of search programs.

Module-IV: Search techniques

1. What do you mean by problem solving agents? searching for solutions
2. Explain depth limited search, bidirectional search.

Module-V: Heuristic search strategies

1. Explain Greedy best-first search
2. How Hill climbing search and simulated annealing search are different from each other?

Module-VI: Adversarial search

1. What do you mean by optimal decisions & strategies in games?
2. Explain the mini max search procedure, alpha-beta pruning.

Module-VII: Knowledge & reasoning

1. Explain different knowledge representation issues, representation & mapping.
2. Mention different approaches to knowledge representation. What are the issues in knowledge representation?

Module-VIII: Using predicate logic

1. How you represent simple facts in logic?

2. Explain ISA relationship, computable functions & predicates.

Module-IX: Representing knowledge using rules

1. Differentiate Procedural and declarative knowledge
2. Explain logic programming. What are the differences between forward and backward reasoning?

Module-X: Probabilistic reasoning

1. How you represent knowledge in an uncertain domain?
2. Explain the semantics of Bayesian networks. What do you mean by Dempster-Shafer theory?

Module-XI: Planning

1. Explain the components of a planning system. What is Goal stack planning?
2. What do you mean by Hierarchical planning?

Module-XII: Natural Language processing

1. Explain Syntactic processing in NLP.
2. What do you mean by semantic analysis?

Module-XIII: Learning

1. Explain the different forms of learning. What do you mean by inductive learning, learning decision trees, explanation based learning?
2. Differentiate neural net learning & genetic learning.

Module-XIV: Expert Systems

1. How do you representing and use domain knowledge?
2. Explain expert system shells, knowledge acquisition.

UNIVERSITY OF ENGINEERING AND MANAGEMENT,JAIPUR

Lecture-wise Plan

Subject Name: Bioinformatics Subject Code: MCSE302B

Year:2nd Year Semester: 3rd

Module Number	Topics	Number of Lectures
1	**Introduction to Molecular biology**	**5L**
	1. Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles.	1
	2. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA: Basic structure, Difference between RNA and DNA. Types of RNA	2
	3. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Tranlation, Introduction to Metabolic Pathways.	2
2	**Sequence Databases**	**2L**
	1. Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases.	1
	2. Sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed	1
3	**DNA sequence analysis**	**14L**
	1. DNA Mapping and Assembly : Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR)	2
	2. Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules	2
	3. Mapping Long DNA Molecules. DeBruijn Graph	2
	4. local and global alignment, pair wise and multiple alignment	3
	5. Dynamic Programming Concept	2
	6. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.	3
4	**Introduction Probabilistic models used in Computational Biology**	**8L**
	1. Probabilistic Models; Hidden Markov Model : Concepts, Architecture	2
	2. Transition matrix, estimation matrix. Application of HMM in Bioinformatics	2
	3. Gene finding, profile searches, multiple sequence alignment and regulatory site identification	2
	4. Bayesian networks Model :Architecture,	2

	Principle ,Application in Bioinformatics	
5	**Biological Data Classification and Clustering**	**6L**
	1. Assigning protein function and predicting splice sites	2
	2. Decision Tree Gene Expression Clustering	2
	3. K Means Algorithm.	2
Total Number Of Hours = 37		

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Assignment:

Module-I: Introduction to Molecular biology

1. What is RNA? Explain its Basic structure. What are the difference between RNA and DNA?
2. Mention the basic components and structure of Protein.

Module-II: Sequence Databases

1. What is DNA sequence databases?
2. What do you mean by Bioinformatics? What are the latest challenges in Bioinformatics? Explain Protein Sequence Databases.

Module-III: DNA sequence analysis

1. Explain Polymerase Chain Reaction (PCR) and Sequencing Short DNA Molecules
2. What is DeBruijn Graph? Explain Smith-Waterman algorithm.

Module-IV: Introduction Probabilistic models used in Computational Biology

1. Explain the architecture of Hidden Markov Model. What are the application of HMM in Bioinformatics?
2. Explain the architecture of Bayesian networks Model.

Module-V: Biological Data Classification and Clustering

1. Describe Decision Tree Gene Expression Clustering.
2. Explain K Means Algorithm. Why we have to use this algorithm?

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: Compiler Design — Subject Code-MCSE302D

Year: 2nd Year MTech — Semester: Third

Module Number	Course Details	Number of Lectures
UNIT 1	**Introduction to Compiler:**	**4LH**
1	• Compiler Construction tools • Analysis of the source program • The Phases of a Compiler • Cousins of the Compiler • Grouping of phases – Front and back ends, passes • Introduction, Types of translators	
2	**Lexical Analysis:**	**6LH**
	• Role of Lexical Analyzer • Token, Patterns and Lexemes • Input buffering – buffer pairs and sentinels	
UNIT 2	**Syntax Analysis:**	**7LH**
3	• The role of a parser • Context free grammars, Writing a grammar • Top down Parsing • Non-recursive Predictive parsing (LL), Bottom up parsing, Handles • Viable prefixes • Operator precedence parsing • LR parsers (SLR, LALR), Parser generators (YACC) • Error Recovery strategies for different parsing techniques.	
4	**Syntax directed translation:**	**7LH**
	• Syntax directed definitions • Construction of syntax trees • Bottom-up evaluation of S attributed definitions • L attributed definitions • Bottom-up evaluation of inherited attributes.	
UNIT 3	**Type checking:**	**7LH**
5	• Type systems • Specification of a simple type checker • Equivalence of type expressions • Type conversions	
	Run time environments:	

6	• Source language issues (Activation trees, Control stack, scope of declaration, Binding of names) • Storage organization (Subdivision of run-time memory, Activation records) • Storage allocation strategies • Parameter passing (call by value, call by reference, copy restore, call by name) • Symbol tables • Dynamic storage allocation techniques.	**5LH**
UNIT 4 **7**	**Intermediate code generation:** • Intermediate languages • Graphical representation • Three-address code • Implementation of three address statements (Quadruples, Triples, Indirect triples).	**8LH**
8	**Code optimization and Code generations:** • Introduction • Basic blocks & flow graphs • Transformation of basic blocks • Dag representation of basic blocks, • The principle sources of optimization • Loops in flow graph • Peephole optimization • Code generations • Issues in the design of code generator, a simple code generator • Register allocation & assignment.	
	Total Number Of Hours = 44	

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Assignment:

Module-1(Introduction):

1. Find all strings in the language (a+b)*b(a+ab)* of length less than 4.
2. With the help of a block diagram, show each phase of compiler including symbol table and error handling of a compiler.
3. Give the NFA for the following Regular Expression. Then find a DFA for the same language.
   (a|b)*abb

Module-3 (Syntax Analysis):

1. Construct the Predictive Parsing table for the following grammar:

   E -> E+ T|T

T -> T* F|F

F-> (E) |id

2. Parse the following string by operator precedence parsing:

   Id1+id2*id3

3. What are the main contributions of syntax directed translation in compiler? Design a dependency graph and direct acyclic graph for the string
   a+a*(b-c)+(b-c)*d

4. What is operator precedence parsing? Discuss about the advantage and disadvantage of operator precedence parsing.consider the following grammar:
   E-> TA
   A-> +TA|€
   T-> FB
   B-> *FB|€
   F-> id

   Test whether this grammar is operator precedence grammar or not and show how the string w=id+id*id+id will be processed by this grammar.

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Lecture-wise Plan

Subject Name: **Data Mining & Data Warehousing** Subject Code- MCSE302C
Year: 2ndYear Semester: Third

Module Number	Topics	Number of Lectures
1	**Overview of Data warehousing**	**4L**
	Strategic information and the need for Data warehousing, ,.	1
	Defining a Data warehouse, Evolution of Data warehousing	2
	Data warehousing and Business Intelligence	1
2	**The Building Blocks of Data warehouse**	**5L**
	Defining features – Subject-oriented data, Integrated data, Time-variant data.	2
	Nonvolatile data, Data granularity Data warehouses and Data marts Architectural Types – Centralized, Independent data marts, Federated, Hub-and-Spoke, Data mart bus Overview of components - Source Data, Data Staging,	2
	Data Storage, Information Delivery, Metadata, and Management and Control components.	1
3.	**Business Requirements and Data warehouse**	**6L**
	Dimensional nature of Business data and Dimensional Analysis, Dimension hierarchies and categories, Key Business Metrics (Facts),	3
	Requirement Gathering methods and Requirements Definition Document (contents) Business Requirements and Data Design – Structure for Business Dimensions and Key Measurements, Levels of detail Business Requirements and the Architecture plan Business Requirements and Data Storage Specifications Business Requirements and Information Delivery Strategy	3
4.	**Architectural components**	**7L**
	Concepts of Data warehouse architecture – Definition and architecture in the areas of Data acquisition, Data storage, and Information delivery Distinguishing characteristics – Different objectives and scope.	2
	Data content, Complex analysis for faster response, Flexible and Dynamic, Metadata-driven etc.Architectural Framework – supporting flow of data, and the Management and Control module Technical architecture – Data acquisition, Data storage, and Information delivery Overview of the components of Architectural.	3
	Metadata types by functional areas – Data acquisition, Data storage, and Information delivery Business Metadata – overview of content and examples Technical Metadata – overview of content and examples Metadata Requirements, Sources of Metadata, Metadata management – challenges, Metadata Repository, Metadata integration and standards	2

5.	**Matching information to classes of users**	**12L**
	Information from Data warehouse versus Operational systems, Users of information – their needs and how to provide information, Information delivery – queries, reports, analysis, and applications, Information delivery tools – Desktop environment, Methodology and criteria for tool selection, Information delivery framework, Business Activity Monitoring, Dashboards and Scorecards,.	3
	OLAP in Data warehouse Overall concept of Online Analytical Processing (OLAP), OLAP definitions and rules, OLAP characteristics Major features and functions of OLAP – General features, Dimensional analysis, Hypercubes, Drill Down and Roll Up, Slice and Dice, Rotation, Uses and Benefits,	3
	Data Warehouse and the web Web-enabled Data Warehouse – adapting data warehouse for the web, Web-based information delivery – Browser technology for data warehouse and Security issues, OLAP and Web – Enterprise OLAP, Web-OLAP approaches, OLAP Engine design	3
	Data Mining Overview of Data mining – Definition, Knowledge Discovery Process (Relationships, Patterns, Phases of the process), OLAP versus Data mining, Some aspects of Data mining – Association rules, Outlier analysis, Predictive analytics etc), Concepts of Data mining in a Data warehouse environment, Major Data Mining techniques – Cluster Detection, Decision Trees, Memory-based Reasoning, Link Analysis, Neural Networks, Genetic Algorithms etc, Data Mining Applications in industry – Benefits of Data mining, Discussion on applications in Customer Relationship Management (CRM), Retail, Telecommunication, Biotechnology, Banking and Finance etc.	3
Total Number Of Hours = 34		

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Lecture-wise Plan

Assignment:

1. Define data warehouse? What are the characteristics of data warehouse?

2. Discuss the three-tier architecture of data warehouse.

3. What are the differences between data warehouse and data mart? What is virtual warehouse?

4. Explain K_Mean and DBSCAN clustering technique with proper example.

5. Describe the working principal of PAM algorithm.

6. Discuss different type of data warehousing schema with suitable diagram.

7. Explain the advantages and disadvantages of the decision tree approach over the approach of data mining?

8. Let us consider the following set of transaction in a book shop.
We shall look at asset of only 6 transaction of purches of books. In the first transaction, purchases are made of book on cloud computing (CC), Data bases (D), Theory of Computation (TC), Computer Graphics (CG), Artificial Neural Network (ANN).

A: {ANN,CC,D,TC,CG}

T: $\{t_1,t_2,t_3,t_4,t_5,t_6\}$

t_1: ={ANN, CC, TC, CG}

t_2:= {CC, D, CG}

t_3:={ANN, CC, TC, CG}

t_4:={ANN, CC, D, CG}

t_5:={ANN, CC, D, TC, CG}

t_6:={CC, D, TC}

(a) Find out the support of ANN, CC, D, TC, CG Individually.
(b) Find out the Frequent sets at min. 60% confidence.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: Microelectronics & VLSI Design **Subject Code-MCSE302E**
Year: 2nd Year **Semester: Third**

Module Number	Topics	Number of Lectures
1	**Introduction to VLSI Design**	**6L**
	1. VLSI Design Concepts, Moor's Law, Scale of Integration(SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI)	1L
	2. Design styles- ASIC, PLA, PAL etc.	1L
	3. FPGA, Gate Array based design etc.	1L
	4. Top down, Bottom up, Semi custom, Full custom etc.	1L
	5. Design principles (Digital VLSI-Concept of Regularity etc.)	1L
	6. Design Domains (Behavioral, Structu1, physical-Y chart)	1L
2	**MOS Structures**	**12L**
	1. E-MOS & D-MOS	1L
	2. Charge inversion in E-MOS	1L
	3. Threshold voltage, Flat-Band voltage, Potential balance & Charge balance	1L
	4. Inversion, MOS capacitances	1L
	5. three-terminal MOS structure with Body-effect	1L
	6. four-terminal MOS transistor: Drain current	1L
	7. I-V characteristics, Current-voltage equations (simple derivation),	1L
	8. scaling in MOSFET: General scaling, Constant voltage scaling & Constant field scaling	1L
	9. Short channel effects	2L
	10. CMOS inverter, Simple Combinational Gates-NAND gate and NOR gate using CMOS	2L
3	**Micro-electronic Processes for VLSI Fabrication**	**10L**
	1. Silicon Semiconductor Technology- An Overview, Wafer processing	1L
	2. Oxidation, Epitaxial deposition, Ion-implantation, Diffusion	1L
	3. Cleaning, Etching	1L
	4. Photo-lithography– Positive & Negative photo-resist	1L
	5. Basic CMOS Technology – Steps in fabricating CMOS	1L

	6. Basic n-well CMOS process, p-well CMOS process, Twin tub process	1L
	7. Silicon on insulator (SoI)	1L
	8. Layout Design Rules	1L
	9. Stick diagram with examples	1L
	10. Continue: Stick diagram with examples	1L
4	**Hardware Description Language**	**12L**
	1. Introduction, HDL and software languages, simulation, synthesis, VHDL, capabilities	1L
	2. Basic terminologies, entity, architecture,	1L
	3. Dataflow, structural, behavioural, mixed	1L
	4. Configuration declaration, package declaration, package body	1L
	5. Basic language elements	2L
	6. Details of Behavioural	L
	7. Details of Dataflow	1L
	8. Details of structural	L
Total Number Of Hours = 37L		

Angshuman Khan
Faculty In-Charge

Sandip Das
HOD, ECE Dept.

Assignment:

Module-1(Introduction to VLSI Design):

1. State Moore's law.
2. Describe VLSI design cycle. Why is it called cycle?
3. Write short note: regularity, modularity, locality.
4. What is hierarchical decomposition?
5. Describe 'Y' chart.
6. Duscuss: CPLD, ROM, PLA, PAL, top-down & bottom-up approach, semicustom & full custom design.

Module-2 (MOS structure)

1. Describe accumulation, depletion, inversion, and pinch-off conditions of NMOS.
2. Draw C-V characteristics of MOS capacitor.
3. Discuss threshold voltage.
4. Derive the drain current equation of nMOS.
5. Design XOR gate using CMOS.
6. Prove that size of PMOS is 2.5 times of NMOS.

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Lecture-wise Plan

Module-3 (Micro-electronic Processes for VLSI Fabrication):

1. State Lambda rule and Micron rule?
2. Draw the lay-out of NAND2 and NOR2.
3. Draw the stick diagram of CMOS.
4. What is SOI and twin tub process?
5. Describe n-well fabrication process.
6. Describe the fabrication process of CMOS.

Module-4(HDL):

1. State the difference between hardware and software language.
2. What is the difference between synthesis and simulation?
3. What is the difference between variable and signal?
4. What is '9 value logic'?
5. Design D latch and D flipflop in dataflow style.
6. Write a short note on derived datatypes.