LESSON PLAN

MCA Third Semester

CIME
BHUBANESWAR
उद्‌मेन ही सिध्यन्ति

COLLEGE OF IT AND MANAGEMENT EDUCATION

(A Constituent College of Biju Patnaik University of Technology, Rourkela)

MCPC2001
Design and Analysis of Algorithm (3-0-0)

Faculty: Shesha Shankar Gnanindranath Mishra

Credit : 3
Credit Hour: 36

Course Objectives:

The objective of the course is to:

- Design and analysis of algorithms and find complexity on them.
- Find the complexity of different sorting algorithm.
- Understand the dynamic programming and greedy algorithms
- Analyze and implementation of Graph Algorithms
- Demonstrate NP-Completeness and Approximation Algorithms

Course Outcomes:

Upon successful completion of this course, the student shall be able to:

CO 1. Identify the different design technique of algorithm.

CO 2. Analyze the different sorting algorithm based on time and space.

CO 3. Analyze the different approaches of designing algorithm like dynamic programming and greedy algorithms

CO 4. Discuss different graph algorithm.

Syllabus

Module-1 : Introduction to design and analysis of algorithms, Growth of functions, Recurrences, Solution of recurrences by Substitution, Recursion tree and Master method, Worst case analysis of Merge sort, Quick sort and Binary search, Heap sort: Heaps, Building a heap, The Heap sort algorithm, Priority Queue, Lower bounds for sorting

Module-II : Dynamic Programming: Matrix-chain multiplication, Elements of dynamic programming, longest common subsequence.Greedy Algorithms: An activity-selection problem, Elements of greedy strategy, Fractional knapsack problem, Huffman codes

Module-III : Data structures for Disjoint Sets: Disjoint set operations, Linked-list representation of disjoint sets, Disjoint-set forests. Graph Algorithms: Elementary Graph Algorithms: Representations of graphs, Breadth-first search, Depth-first search, Minimum Spanning Trees: Kruskal and Prim's algorithms, Single-Source Shortest Paths: The Bellman-Ford and Dijkstra's algorithm, All-Pairs Shortest Paths: The Floyd-Warshall Algorithm.

Module-IV : Maximum Flow: Flow Networks, The Ford-Fulkerson method, Polynomials and the FFT: Representation of polynomials, The DFT and FFT, String Matching: The naïve string-matching algorithm, The Rabin-Karp algorithm. NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility-completeness proofs, NP-completeness problems, Approximation Algorithms: The vertex-cover problem, The travelling-salesman problem, The set-covering problem, The subset-sum problem.

Books:

1. Introduction to Algorithms: T. H. Cormen, C. E. Leiserson, R. L. Rivest (PHI), Second Edition.
2. E. Horowitz, S. Sahani, S. Rajsekharan," Fundamentals of Computer Algorithms", Second Edition, Universities Press,2007

Reference Books:

1. Design and Analysis of Algorithm – M R Kabat, PHI Learning Pvt. Ltd.
2. Algorithm Design –Goodrich, Tamassia, WileyIndia.
3. Algorithms By Sanjay Dasgupta, Umesh Vazirani – McGraw-Hill Education

LESSON PLAN

(Students are encouraged to clear previous class doubt in First 10 Mins in every class)

Sl No	Topic	Session	Pedagogy
Module I			
1	Introduction to design and analysis of algorithms, Growth of functions, Complexity	1	Lecture and Questionnaires.
2	Complexity analysis of some algorithms.	1	Lecture and demonstration
3	Complexity analysis of some recursive algorithms.	1	Lecture and demonstration
4	Recurrences, Solution of recurrences by Substitution.	1	Lecture, Derivation
5	Master method.	1	Lecture, Group exercise
6	Recursion tree.	1	Derivation, Group exercise
7	Divide and Conquer Approach: Merge sort. Analysis of Merge sort.	1	Flip class. Question answer
8	Quick sort Analysis of Quick sort.	1	Lecture. Performance analysis
9	Heap sort: Heaps, Building a heap, The Heap sort algorithm.	1	Lecture, Problem solving, Performance analysis
10	Priority Queue, Lower bounds for sorting.	1	Lecture with board work
11	**Module Review and doubt clearing session**	1	Question answer, Problem solving session
Module II			
12	Dynamic Programming: Elements of dynamic programming.	1	Lecture, Explanation by example
13	Matrix-chain multiplication.	1	Board work, Tabular solution
14	Longest common subsequence.	1	Board work, Tabular solution
15	Greedy Algorithms: Elements of greedy strategy.	1	Board work, Comparison study
16	An activity-selection problem, Fractional knapsack	1	Problem solving session
17	Huffman codes.	1	Diagrammatic explanation
18	**Module review and Doubt clearing session.**	1	Seminar/Peer level doubt clearing

Module III			
19	Data structures for Disjoint Sets: Disjoint set operations, Linked-list representation of disjoint sets.	1	PPT Presentation
20	Disjoint-set forests.	1	Lecture by demonstration
21	Graph Algorithms: Elementary Graph Algorithms: Representations of graphs.	1	Lecture by demonstration.
22	Breadth-first search, Depth-first search.	1	Diagrammatic approach, Performance analysis
23	Minimum Spanning Trees: Kruskal algorithm.	1	Diagrammatic solution. Performance analysis
24	Minimum Spanning Trees: Prim's algorithm.	1	Diagrammatic solution. Performance analysis
25	Single-Source Shortest Paths: The Bellman-Ford and Dijkstra's algorithm.	1	Diagrammatic solution. Performance analysis
26	All-Pairs Shortest Paths: The Floyd-Warshall Algorithm.	1	Diagrammatic solution. Performance analysis
27	**Doubt clearing session.**	1	Student-student session
Module IV			
28	Maximum Flow: Flow Networks, The Ford-Fulkerson method.	1	Board work, Step wise solution
29	Polynomials and the FFT: Representation of polynomials.	1	Lecture
30	The naïve string-matching algorithm.	1	Lecture with demonstration. Performance analysis
31	The Rabin-Karp string-matching algorithm.	1	Step wise solution. Performance analysis
32	NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility.	1	Board work, Group Discussion
33	NP-completeness proofs, NP-completeness problems.	1	Lecture
34	Approximation Algorithms: The vertex-cover problem, The travelling-salesman problem.	1	Lecture, Comparison study
35	The set-covering problem, The subset-sum problem.	1	Lecture, Comparison study
36	**Revision and doubt clearing session**.	1	Model Question paper discussion
	Total	36	

CSPC2002
OPERATING SYSTEM(3-0-0)

Faculty : Susanta Kumar Behera

Credit : 3

Credit Hour: 36

Course Objectives

- To understand the fundamental concepts and role of Operating System.
- To learn the Process Management and Scheduling Algorithms
- To provide a detailed discussion of the various memory management techniques
- To gain insight on I/O and File management techniques
- Understand various problems related to concurrent operations and their solutions.

Course Outcomes

CO 1. Understand the structure and functions of Operating System and how of the working principle of various types of operating systems

CO 2. Ability to comprehend the techniques used to implement the process manager

CO 3. Compare the performance of Scheduling Algorithms and Analyze resource management techniques

CO 4. Ability to comprehend virtual memory abstractions in operating systems

Syllabus

MODULE-1: Operating Systems: Definition, Generations of Operating systems, Types of Operating System, Functions of operating System, Abstract view of OS, System Structures, System Calls. **Processes**: Definition, Process Relationship, Process states, Process State transitions, Process Control Block, Context switching, Threads, Concept of multithreads, Benefits of threads, Types of threads.

MODULE-2: Process Scheduling: Definition, Scheduling objectives, Types of Schedulers. Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time, Scheduling algorithms: Preemptive and Non-preemptive, FCFS, SJF, RR, Priority Scheduling, Multiple Queue Scheduling, Multilevel Feedback Queue Scheduling. **Deadlocks:** Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

MODULE-3: Inter-process Communication: Race Conditions, Critical Section, Mutual Exclusion, Peterson's Solution, The Producer Consumer Problem, Semaphores, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Memory Management: Main Memory, Swapping, Memory allocation Methods, Internal and External fragmentation and Compaction, Paging, Structure of Page Table, Segmentation, Virtual Memory: Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

MODULE-4: Disk management: Disk Structure, Disk Scheduling, RAID Structure. **I/O Management**: I/O devices, direct memory access. File Management: File concept, access methods, File types, File operation, Directory structure, Allocation methods (contiguous, linked, indexed). **Security & Protection:** Security Environment, Design Principles of Security, User Authentication.

Text Book:

1. Operating System Concepts (9th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley Indian Edition.

Reference Books:

1. Modern Operating Systems (Fourth Edition) by Andrew S Tanenbaum, Prentice Hall India.
2. William Stallings, "Operating Systems Internals and Design Principles", Pearson, 2018, 9th Edition.

LESSON PLAN

Sl	Topic	Session	Pedagogy
	Module I		
1	Definition, Generations of Operating systems, Types of Operating System	1	Lecture
2	Functions operating System	1	Lecture and Demonstration
3	OS Structure	1	Lecture
4	System Calls	1	Practical
5	Program vs Process, States of Process	1	Lecture and Demonstration
6	Process State Transition and Context Switch	1	Lecture and Demonstration
7	Thread Concept and benefits of multi threaded program	1	Flip class.
8	Types of thread	1	Lecture
	Module II		
9	Scheduling objective, Types of Scheduling	1	Lecture
10	Scheduling Criterion	1	Lecture
11	Non Pre-emptive Algorithms: FCFS,SJF, Priority based	1	Lecture and Problem solving
12	Pre-emptive Algorithms: Round Robin	1	Problem solving
13	SRTN algorithm,Priority based Non-preemptive algorithm	1	Problem solving
14	Multilevel Queue Scheduling	1	Lecture and Demonstration
15	Multilevel Feedback Queue Scheduling	1	Lecture and Demonstration
16	Deadlock Characteristics	1	Lecture
17	Prevention of Deadlock	1	Lecture, Real life example

18	Banker's Algorithm for deadlock avoidance	1	Lecture and Demonstration
19	Deadlock detection	1	Lecture and Demonstration
20	Recovery from Deadlock	1	Lecture and Demonstration
Module III			
21	Race Conditions, Critical Section Problem and its solution	1	Lecture and Demonstration
22	Peterson Solution	1	Lecture and Demonstration
23	Semaphore Concept and operations	1	Lecture and Demonstration
24	Producer Consumer problem and its solution through Semaphore	1	Lecture and Demonstration
25	Inter Process Communication	1	Lecture, Group Discussion
26	Reader Writer Problem	1	Lecture and Demonstration
27	Dining Philosopher Problem and its deadlock free solution	1	Lecture and Demonstration
28	Memory Management : Basic Hardware ,Address binding ,Linking	1	Lecture and Demonstration
29	Contiguous Memory allocation :Fixed Partitioning and variable partitioning	1	Lecture and Demonstration
30	Non Contiguous Memory allocation: Paging, Segmentation, Segmentation with Paging	3	Lecture and Demonstration
31	Internal Fragmentation and external fragmentation, Compaction	1	Lecture and Demonstration
32	Page replacement algorithms	2	Lecture and Demonstration
32	Thrashing and working set model	1	Lecture and Demonstration
Module IV			
31	Disk Structure, Disk Scheduling (FCFS,SSTF)	1	Lecture and Demonstration
32	SCAN,LOOK,C- SCAN ,C – LOOK algorithms	1	Lecture and Demonstration
33	File types, operations, Directory Structure	1	Lecture and Demonstration
34	Allocation Methods	1	Lecture and Demonstration
35	Security and Protection	1	Lecture and Demonstration

MCPE2004
Internet and Web Technology(3-0-0)

Faculty : Sabita Rani Behera
Credit : 3
Credit Hour: 36

Course Objectives:

To learn about the concept of Internet and a Web

To learn how to design Website

To learn about client scripting and server scripting language to implement client server communication

Syllabus

Module-1: TCP/IP Overview: TCP/IP and Internet: Layers of TCP/IP, Network Layer: Addressing, Sub netting, Introduction to WWW, WWW Architecture, URL, Domain Name, Overview of HTTP, Client server model , Web browser and Web servers , Generation of dynamic web pages, Features of Web 2.0 ,Web Hosting. **Web Design**: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Web site, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

Module-2: HTML:Basics of HTML, formatting and fonts, commenting code, color , images, hyperlink, lists, tables, forms, XHTML, Meta tags, Character entities, frames and frame sets, features of HTML5. **Style sheets** : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, Internal ,External and Inline style, Background images, colors and properties, Manipulating text ,Margins and Padding ,Positioning using CSS. **XML**: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas

Module-3: JavaScript: Client-side scripting with JavaScript, variables, functions, conditions, loops and repetition **Advance JavaScript**: JavaScript and objects, JavaScript Built in objects, the DOM and web browser environments, Manipulation using DOM, forms and validations. **DHTML**: Combining HTML, CSS and JavaScript, Events and buttons

Module-4: PHP: Introduction and basic syntax of PHP, decision and looping statement, Arrays, Functions, Browser control and detection, string handling, Form processing ,Files ,PHP with Database connectivity, Cookies and Session handling in PHP

Reference Books:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Web Technologies, Black Book, dreamtech Press
3. HTML 5, Black Book, dreamtech Press
4. The Complete Reference – PHP, Steven Holzner, Tata McGraw Hill, 2008.
5. PHP & MySQL in easy Steps, Mike Mcgrath, Tata McGraw Hill, 2012.
6. Web Design, Joel Sklar, Cengage Learning
7. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

LESSON PLAN

Sl. No.	Topic Covered	Session	Pedagogy
Module 1: TCP/IP & Web Design Overview			
1	Introduction to Internet, History of Internet and OSI vs TCP/IP architecture, Layers of TCP/IP	1	Lecture real-world analogies, and Board explanation
2	Network Layer Functionalities and concept of IP Addressing, Classful and Classless addressing	1	Problem-solving with numerical examples, interactive discussion
3	Sub netting and CIDR notation with Real life application	1	Problem-solving with real life numerical examples, interactive discussion
4	Concept of WWW, Architecture, Web browser, Web Server, URL, Domain Name System HTTP Protocol	1	Lecture with diagrams
5	Dynamic Web Pages, Features of Web 1.0, Web 2.0 and Web 3.0, Web Hosting	1	Lecture with real world case studies of websites
6	Web Design Concepts, Browser & Bandwidth Issues, Operating system and Caching issues	1	Lecture with board explanation
7	Display Resolution, Look & Feel, Page Layout, Linking	1	Visualizing with sample HTML/CSS
8	User-Centric Design, Sitemap, Website Planning and Effective Navigation & Publishing Websites	1	create a sitemap for a hypothetical site
Module 2: HTML, CSS & XML			
9	Basics of HTML: Text formatting, Fonts, Colors, Lists	1	HTML code Implementations
10	Images, Hyperlinks, Tables	1	Hands-on lab exercises
11	Forms Design	1	Practical demonstration with Hands-on lab exercises
12	XHTML, Meta Tags, Character Entities, Frames	1	Lecture with coding practice
13	HTML5 Features & Enhancements	1	Practical demonstration of HTML5 tags
14	CSS Introduction: Syntax, Structure, Internal, External, Inline	1	Lecture with coding examples

15	CSS Properties: Backgrounds, Colors, Text, Margins, Padding	1	Hands-on practice
16	CSS Positioning: Relative, Absolute, Fixed	1	Visual demonstration with coding
17	XML Basics: Structure, Uses, Key Components	1	Lecture ,coding
18	DTD & XML Schema	1	Hands-on lab exercise for validation
Module 3: JavaScript & DHTML			
19	JavaScript Basics: Variables, Conditions, Loops	1	Lecture with coding demonstration
20	Function, JavaScript Objects & Built-in Objects	1	Hands-on activity with examples
21	DOM & Web Browser Environment	1	Demonstration with coding
22	Forms & Validations using JavaScript	1	Lab-based exercise with real-time validation
23	DHTML: Integrating HTML, CSS, and JavaScript	1	Project-based task
24	Events & Buttons in JavaScript	1	Interactive coding session
Module 4: PHP			
25	Introduction to PHP: Syntax, Variables, constants and operators	1	Practical installation of XAMPP server
26	PHP Decision making statements and Loops,	1	Practical demonstration
27	Arrays in PHP	1	Lecture with coding
28	Functions handing in PHP	1	Hands-on exercise
29	Browser Control, String Handling in PHP	1	Practical coding
30	Form Processing in PHP	1	Practical session with real-time form design
31	File Handling in PHP	1	Practical implementation
32	PHP with Database (MySQL)	1	Practical implementation with sample database
33	Cookies & Session Handling	1	Practical implementation
34	Advance PHP concept	1	Lecture with board explanation
35	Exercise on reviewing module 2,3 and 4	1	Lab-based work
36	Mini Project Development	1	Lab-based work

MCPE2007
Soft Computing (3-0-0)

Faculty: Dr. Rajalaxmi Mishra

Credit : 3

Credit Hour: 36

Course Objectives:

1. To introduce the fundamental concepts of Soft Computing Techniques.
2. To understand the feasibility of applying a soft computing methodology for a particular problem.
3. To develop and understanding of Neural Networks, Fuzzy System and Genetic Algorithm.
4. To explore advanced topics such as Hybrid systems, GA based Back propagation Networks and Fuzzy Back propagation Networks.

Course Outcomes: Upon successful completion of this course, students should be able to:

CO1: Apply the techniques of soft computing and foster their abilities in designing and implementing soft computing-based solutions for real-world engineering problems.

CO2: Analyze neural networks to pattern recognition, classification and regression problems to evaluate solutions by various soft computing approaches.

CO3: Apply and design fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO4: Examine and formulate genetic algorithm to combinatorial optimization problems

Syllabus

MODULE – I: Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.**Neural Networks:**What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back Propagation networks, Architecture of Backpropagation(BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

MODULE – II: Fuzzy Systems: Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification. **Genetic Algorithm:** History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

MODULE – III : Hybrid Systems: Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

MODULE – IV: GA based Backpropagation Networks: GA based Weight Determination, K - factor determination in Columns, **Fuzzy Backpropagation Networks:**LR type Fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks.

Text Book:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.

Reference Books:

1. Genetic Algorithms: Search and Optimization, E. Goldberg.
2. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.

LESSON PLAN

Sl. No.	Topic Covered	Session	Pedagogy
Module – I			
1	Introduction to Soft Computing	1	Lecture with real-life examples, Board Work
2	Hard vs Soft Computing	1	Comparative discussion, Board Work diagrams
3	Requirement & Major Areas of Soft Computing	1	Brainstorming session, case studies
4	Applications of Soft Computing	1	Demonstrations with examples
5	Introduction to Neural Networks	1	Lecture with biological neuron analogy
6	Learning Rules (Hebbian, Delta, Perceptron, Competitive)	1	Board work + solved examples
7	Activation Functions (Step, Sigmoid, Tanh, ReLU)	1	Graph plotting, interactive Q&A
8	Single-layer Perceptron	1	Hands-on problem solving
9	Back propagation Networks – Architecture	1	Board work + diagram explanation
10	Back Propagation Learning Process	1	Step-by-step derivation, numerical example
11	Variations of BP Networks	1	Comparative discussion
12	Associative Memory & ART	1	Concept explanation, real-world examples
13	Self-Organizing Maps	1	Demonstrations with Examples
14	Recent Applications of Neural Networks	1	Seminar / student presentations
Module – II: Fuzzy Systems & Genetic Algorithms			
15	Fuzzy Set Theory & Crisp vs Fuzzy	1	Board explanation, example problems
16	Fuzzy Relations, Fuzzification	1	Diagrammatic explanation
17	Min-Max Composition & Defuzzification	1	Step-by-step examples

18	Fuzzy Logic & Rule-based Systems	1	IF–THEN rule examples
19	Predicate Logic & Fuzzy Decision Making	2	Problem-solving session
20	Fuzzy Control Systems & Classification	1	Case study: washing machine, AC
21	History & Principle of GA	1	Lecture + analogy with evolution
22	Encoding Methods & Fitness Functions	1	Demonstration with board work
23	GA Operators – Selection, Crossover, Mutation	1	Demonstration with Examples
24	Convergence, Bitwise Ops, Multi-level Optimization	1	Discussion with numerical examples
Module – III: Hybrid Systems			
25	Sequential, Auxiliary, Embedded Hybrid Systems	1	
26	Neuro-Fuzzy Hybrid Systems	1	Board Work + examples
27	Neuro-Genetic Hybrid Systems	1	Simulation example
28	Fuzzy-Genetic Hybrid Systems	1	Board Work + application discussion
Module – IV: Advanced Applications			
29	GA-based Weight Determination in BP Networks	1	Mathematical derivation, coding demo
30	K-factor Determination	1	Step-by-step example
31	Fuzzy Back propagation Networks – LR-type Numbers	1	Diagram + explanation
32	Fuzzy Neuron & Architecture	1	Board diagram + coding demo
33	Learning in Fuzzy BP	1	Step-by-step explanation
34	Applications of Fuzzy BP Networks	1	Case study + Q&A session
35	**Revision & Mock Test**	1	Quiz, past question paper discussion
	Total	36	