C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 1 **CODE**: PGCE101
NAME: Object Oriented Methodology and Implementation (OOM)

Teaching & Evaluation Scheme:

Teaching Scheme				Evaluation Scheme								
				Theory					Practical (Marks)			
Th	Tu	Pr	Total	Sessional Exam		University Exam		Total	PR/ Viva	TW	Total	Total
				Marks	Hours	Marks	Hours					
4	0	2	6	30	1.5	70	2.5	100	30	20	50	150

Objectives:
Implementation of basics OOP design patterns and methodology with UML modeling language

Prerequisites:
Basic Knowledge modeling and object oriented Concept and Object Oriented Programming.

Course outline:
Object Oriented Methodology (OOM) is a system development approach encouraging and facilitating re-use of software components. With this methodology, a computer system can be developed on a component basis which enables the effective re-use of existing components and facilitates the sharing of its components by other systems.

Sr. No.	Course Contents
1	**What is Object –Oriented?** Characteristics of Object, what is Object-Oriented Development? Key concepts of Object Oriented Design Object Oriented Themes, Overview of Object-Oriented Systems Development: Systems Development Life Cycle: Unified Approach, Object-Oriented Methodology, Unified Modeling Language
2	**Object Orientation Concepts:** Object, Class and instance, inheritance, polymorphism, Object-Oriented Analysis Requirements, Model (Use case), Object Analysis, Object Relationship Analysis, Modeling diagrams: Use case, class, object
3	**Object-Oriented Implementation:** Implementing Classes, Programming with Multiple Classes ,Interfaces, Abstract Classes, Comparing Objects for Equality, A Notation for Describing Object-Oriented Systems, Organizing the Classes, Collection Classes, Exceptions, Run-Time Type Identification, Graphical User Interfaces: Programming Support, Long-Term Storage of Objects
4	**Modeling Diagrams**: Dynamic Models, Object Interaction, Diagrams and State Diagrams, Use case, class, object, sequence, state-chart, component,deployment
5	**Elements of Design Patterns:** Various Design patterns, Iterator, Singleton, adapter
6	**Design and Implementation:** Design, Implementing design

7	**Analyzing a System:** Overview of the Analysis Phase, Functional Requirements Specification, Use case analysis, Defining Conceptual Classes and Relationships,Using the Knowledge of the Domain
8	**Exploring Inheritance Applications of Inheritance, Inheritance:** Some Limitations and Caveats, Type Inheritance,Improving the Design,Consequences of Introducing Inheritance,Multiple Inheritance
9	**Interactive Systems and the MVC Architecture**: The MVC Architectural Pattern, Analyzing a Simple Drawing Program,Designing the System,Design of the Subsystems,Getting into the Implementation,Implementing the Undo Operation,Drawing Incomplete Items,Adding a New Feature,Pattern-Based Solutions
10	**Designing with Distributed Objects:** Client/Server Systems, Java Remote Method Invocation,Implementing an Object-Oriented System on the Web

Learning Outcomes:

1. Object-oriented analysis and design (OOAD) has over the years, become a vast field, encompassing such diverse topics as design process and principles, documentation tools, refactoring, and design and architectural patterns. For the students learning experience is incomplete without implementation. This course provides a comprehensive introduction to OOAD.
2. The salient points of its coverage are:
   - A sound footing on object-oriented concepts such as classes, objects, interfaces, inheritance, polymorphism, dynamic linking, etc.
   - A good introduction to the stage of requirements analysis.
   - Use of UML to document user requirements and design.

Teaching & Learning Methodology:

The subject should be teaching by series of lecture and laboratories practical with hands on assignments.

Books Recommended:

1. Object Oriented Modeling and Design, Rumbaugh, Blaha , Premerlani, Eddy, Lorensen; Prentice Hall (1991).
2. Object Oriented Analysis Design and Implementation, Brahma Dathan, Sarnath Ramnath; Springer (2011).
3. Object Oriented Analysis & Design, Grady Booch, and Benjamin Cummings; Addison-Wesley Longman Verlag (2007).

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 1 **CODE**: PGCE102
NAME: Distributed Systems & Application (DSA)

Teaching & Evaluation Scheme:

Teaching Scheme				Evaluation Scheme								
				Theory					Practical (Marks)			
Th	Tu	Pr	Total	Sessional Exam		University Exam		Total	PR/ Viva	TW	Total	Total
				Marks	Hours	Marks	Hours					
4	0	2	6	30	1.5	70	2.5	100	30	20	50	150

Objectives:

- To understand basics of distributed Systems.
- To understand Processes and processors in distributed systems

Prerequisites:

- Basic Knowledge of Networks/System

Course outline:

Sr. No.	Course Contents
1	**Introduction to distributed Systems:** Definition and goals, Hardware and Software concepts, Design issues
2	**Communication in Distributed System:** Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC
3	**Synchronization in distributed systems:** Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems
4	**Processes and processors in distributed systems:** Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues
5	**Distributed File Systems:** Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, and file caching scheme, and file replication, fault tolerance, trends in distributed file system, case study.
6	**Distributed Shared Memory:** Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing
7	**Case Study:** Amoeba, Mach, Chorus, DCE

Learning Outcomes: -

At the end of this module the student should be well familiar with:

- Distributed Shared Memory
- Distributed File Systems
- Processes and processors in distributed systems
- Communication

Books Recommended:

1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha; PHI
2. Distributed Operating Systems, Andrew S Tannebaum; PHI

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: COMPUTER ENGINEERING
SEMESTER: 1 **CODE**: PGCE103
NAME: Computer Algorithm and Complexity theory (CAC)

Teaching & Evaluation Scheme:

Teaching Scheme				Evaluation Scheme								
				Theory					Practical (Marks)			
Th	Tu	Pr	Total	Sessional Exam		University Exam		Total	PR/ Viva	TW	Total	Total
				Marks	Hours	Marks	Hours					
4	0	2	6	30	1.5	70	2.5	100	30	20	50	150

Objectives: Main Objective to study this subject is to get knowledge about whole algorithm analysis and designing process with its complexity.

Prerequisites: Basic Awareness of algorithm and C programming is required. Basic knowledge of Data Structure is required.

Course outline:

Sr. No.	Course Contents
1	**Introduction:** Algorithms; analysis and design of algorithms, Type of recurrences.
2	**Sorting, Searching, Order Statistics:** Selection sort, Merge Sort, Quick Sort, Heap sort, Linear time sorting, Linear and Binary Search, medians and other statistics
3	**Advanced Data Structures:** Binary tree, AVL tree, RB tree, B-trees; binomial heaps; Fibonacci heaps; Data structures for disjoint sets.
4	**Advanced Design and Analysis Techniques:** Dynamic programming; greedy algorithms; amortized analysis
5	**Graph Algorithms:** Elementary graph algorithms; Minimum spanning trees; Single source Shortest paths; All- pairs shortest paths; Maximum flow; Backtracking; Topological sorting.
6	**Algorithms for Common Applications:** Sorting networks; Algorithms for parallel computers; Approximation Algorithms; Heuristic algorithms and String matching.
7	**Algebraic Simplifications and Transformations:** P, NP-Hard and NP-Complete problems.

Learning Outcomes:

1. A successful student will have acquired the skills to understand, develop, and analyze recognizers for programming languages.
2. The student will also be able to deploy efficient and methodical techniques for algorithmic designing and computing of complexity.

Books Recommended:

1. Computer Algorithms, Coreman, MIT Press
2. Design and Analysis of Computer Algorithms, Aho,Hopcroft and Ullman, Pearson
3. The Algorithm Design Manual, Steve s. Skiena
4. Fundamental of Algorithmic, Bratt Ley

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 1 **CODE**: PGCE104
NAME: Wireless Networking (WN)

Teaching & Evaluation Scheme:

Teaching Scheme				Evaluation Scheme								
				Theory					Practical (Marks)			
Th	Tu	Pr	Total	Sessional Exam		University Exam		Total	PR/ Viva	TW	Total	Total
				Marks	Hours	Marks	Hours					
4	0	2	6	30	1.5	70	2.5	100	30	20	50	150

Objectives:

- To understand basics of wireless communication networks.
- To understand cellular technologies
- To study Different cellular technologies such as GSM and CDMA

Prerequisites:

- Basic Knowledge of Communication Networks/System

Course outline:

Sr. No.	Course Contents
1	**Introduction:** Introduction of Wireless Communication Network systems and different evaluations
2	**Radio wave propagation mechanisms:** Review of Antenna Theory and radio wave propagation, Spread Spectrum, Coding and Error Control in Wireless Communication, Diversity and smart receiving techniques, Satellite Communications
3	**Basics of Cellular Wireless Networks**: Basics of Cellular Wireless Networks, Cellular network organization, Wireless network topology, cellular topology, cell fundamentals, signal to interference ratio calculation, Power Control
4	**Global system for mobile communication:** Global System for Mobile Communication (GSM), GSM Services and signaling, GSM Mobility Management, GSM Call Management, GSM Radio Link
5	**CDMA Technology, IS-95:** IS-95 standard based CDMA system, IS-95 CDMA Channels, Radio Link Signaling
6	**IEEE 802.11 WLANs:** Mobile IP and WAP, Wireless LAN Technology and Introduction to IEEE 802.11 WLAN Standard, PAN, Infrared, Blue tooth, Zigbee
7	**Adhoc network and PAN:** What is IEEE 802.15 WPAN, Bluetooth technology

Learning Outcomes:

At the end of this module the student should be well familiar with:

- Wireless networks and technologies
- Issues related to Wireless Communications

- Different Cellular technologies (GSM and CDMA)

Books Recommended:

1. Wireless Communications and Networks, William Stallings
2. Wireless Communication Technology, Blake
3. Principles of GSM, Vijay Garg
4. Evolution of 2G-3G Networks, Vijay Garg

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 1 **CODE**: PGCE105
NAME: Soft Computing (SC)

Teaching & Evaluation Scheme:

Teaching Scheme				Evaluation Scheme								
				Theory					Practical (Marks)			
Th	Tu	Pr	Total	Sessional Exam		University Exam		Total	PR/ Viva	TW	Total	Total
				Marks	Hours	Marks	Hours					
4	0	2	6	30	1.5	70	2.5	100	30	20	50	150

Objectives:

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inerencing systems
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

Course outline:

Sr. No.	Course Contents
1	**Soft Computing:** Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing
2	**Artificial Intelligence:** Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non-monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & fillerstructures, NLP
3	**Fuzzy Set Theory:** Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling
4	**Neural Networks:** Supervised Learning Neural Networks, Perceptrons, Adaline, Backpropagation Multilayer Perceptrons, Radial Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Kohonen Self-Organizing Networks,

	Learning Vector Quantization, Hebbian Learning
5	**Neuro Fuzzy Modeling:** Adaptive Neuro-Fuzzy Inference Systems, Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro Fuzzy Modelling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum
6	**Genetic algorithm:** Fundamentals, basic concepts, working principle, encoding, fitnessfunction, reproduction, Genetic modelling: Inheritance operator, cross over, inversion & deletion,mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications &advances in GA, Differences & similarities between GA & other traditional method
7	**Applications of Computational Intelligence:** Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Colour Recipe Prediction

Learning Outcomes:

To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty

Books Recommended:

1. Neuro-Fuzzy and Soft Computing, J.S.R.Jang, C.T.Sun and E.Mizutani; Pearson Education (2004)
2. Fuzzy Logic with Engineering Applications, Timothy J.Ross; McGraw-Hill, 1997.
3. Genetic Algorithms: Search, Optimization and Machine Learning, Davis E.Goldberg; Addison Wesley, N.Y.(1989.)
4. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran and G.A.V.Pai; PHI (2003).
5. Computational Intelligence - PC Tools, R.Eberhart, P.Simpson and R.Dobbins; AP Professional, Boston (1996).
6. Neural Networks Fuzzy Logic, and Genetic Algorithms, S. Rajasekaran and G. A. Vijaylakshmi Pai; Prentice Hall of India.
7. First Course on Fuzzy Theory and Applications, K.H.Lee; Springer-Verlag.
8. Fuzzy Logic, Intelligence, Control and Information, J. Yen and R. Langari; Pearson Education.
9. Artificial Intelligence, Elaine Rich & Kevin Knight; Second Edition, Tata Mcgraw Hill Publishing Comp., New Delhi (2006)
10. Fuzzy Logic with Engineering Applications, Timothy J.Ross; McGraw-Hill (1997)
11. Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain, Amit Konar; CRC Press (2008)

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 1 **CODE**: PGCE106
NAME: Software Forensics (SF)

Teaching & Evaluation Scheme:

Teaching Scheme				Credits	Evaluation Scheme								
					Theory					Practical (Marks)			
Th	Tu	Pr	Total	6	Sessional Exam		University Exam		Total	PR/ Viva	TW	Total	Total
					Marks	Hours	Marks	Hours					
4	0	2	6		30	1.5	70	2.5	100	30	20	50	150

Objectives:
To provide understanding of software forensics and their use in the development of cybercrime for evidence techniques

Prerequisites:
Basic Knowledge of cryptography, computer programming and operating system concepts and computer security techniques

Course outline:

Sr. No.	Course Contents
1	**Introduction to Software Forensics:** Digital Forensic Definitions, objectives & objects of Software forensics, Software Forensic Tools, Software Forensic Technologies & Practices, Legal Considerations.
2	**Overview of Computer Forensic Technology:** Types of Software forensic technology, Types of Computer Forensics System,
3	**The Players— Hackers, Crackers, Phreaks, and Other Doodz:** Terminology: Type of Black hats, Motivations & Rationales, General Characteristics, and Black hat Products.
4	**Software Code & Analysis Tools**: The Programming Process, The Products, The Resulting Objects. The Analytical Tools: Forensic Tools.
5	**Advanced Tools:** Decompilation: Desquirr, DCC, Boomerang. Plagiarism: JPlay, YAP: Other Approaches.
6	**Computer Forensics Evidence and Capture:** Data Recovery, Evidence Collection and data Seizure, Duplication and Prevention of digitan Evidance
7	**Law & Ethics:** Legal Systems, Evidence & Ethics.
8	**Computer Virus & Malware Concepts & Background:** History of Computer Viruses & Worms, Malware Definitions & Structures, Detection & Antidetection Techquies.
9	**Programming Cultures & Indicators:**

	User Interface, Cultural Features & "HELP",Functions, Programming Styles.
10	**Stylistics Analysis & Linguistics Forensics:** Biblical Criticism, Shakespere & Other Literature, Individual Identification & Authentication.
11	**Authorship analysis:** Problems, How can It Work?, Is it Reliable?

Learning Outcomes:

By completing this course student are practically aware with cyber crime and software forensics system, the tools like de compiler, reverse engineering aspect for forensics science

Books Recommended:

1. Software Forensics, Robert M Slade.
2. Computer Forensics computer crime sense investigation, John R.Vacca

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 1 **CODE**: PGCE108
NAME: Embedded System & Design (ESD)

Teaching & Evaluation Scheme:

Teaching Scheme				Evaluation Scheme								
				Theory					Practical (Marks)			
Th	Tu	Pr	Total	Sessional Exam		University Exam		Total	PR/ Viva	TW	Total	Total
				Marks	Hours	Marks	Hours					
4	0	2	4	30	1.5	70	2.5	100	30	20	50	150

Objectives:

- Introduce the students to the issues and challenges in developing embedded systems. Educate them in formal modeling, design and development methodologies.

Prerequisites:

- Knowledge of microprocessor, microcontroller, OS, Basic assembly language programming.

Course outline:

Sr. No.	Course Contents
1	**Embedded Architecture:** Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Embedded system design process- Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration, Formalism for System Design- Structural Description, Behavioral Description, Design Example: Model Train Controller
2	**Embedded Processor And Computing Platform:** ARM processor- processor and memory organization, Data operations, Flow of Control, SHARC processor- Memory organization, Data operations, Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example : Alarm Clock.
3	**Networks:** Distributed Embedded Architecture- Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, Ethernet, Myrinet, Internet, Network-Based design- Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling, Design Example: Elevator Controller.
4	**Real-Time Characteristics:** Clock driven Approach, weighted round robin Approach, Priority driven Approach, Dynamic Versus Static systems, effective release times and deadlines, Optimality of the Earliest deadline first (EDF) algorithm, challenges in validating timing constraints in priority driven systems, Off-line Versus On-line scheduling.

5	**System Design Techniques:** Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design, Quality Assurance, Design Example: Telephone PBX- System Architecture, Ink jet printer- Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes.

Learning Outcomes:

After finishing the course the student shall be able to:

1. Describe the special requirements that are imposed on embedded systems
2. Describe the key properties of microprocessor
3. Sketch a design of an embedded system around a microprocessor
4. Explain how microprocessor, memory, peripheral components and buses interact in an embedded system
5. Evaluate how architectural and implementation decisions influence performance and power dissipation
6. Summarize the basic properties of a real-time operating system
7. Estimate if additional hardware can accelerate a system

Books Recommended:

1. Computers as Components: Principles of Embedded Computing System Design, Wayne Wolf; Morgan Kaufman Publishers (2001)
2. Real-Time systems, Jane.W.S. Liu; Pearson Education Asia (2000)
3. Real-Time Systems, C. M. Krishna and K. G. Shin; McGraw-Hill (1997)