C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 2 **CODE**: PGCE107
NAME: Software Engineering Methodologies (SEM)

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 Software development process with testing and architectural study. Create awareness of various tools

Prerequisites:
Basic Awareness of system analysis and problem solving methods and designing with UML .

Course outline:

Sr. No.	Course Contents
1	**Introduction:** Motivation, Software Attributes, Software characteristics, Software Quality Issues, Software testing
2	**Software Process Software Life cycle Process:** A Sequential Methodology - A Cyclical Methodology - The Water Sluice – Established Methodologies - The Boehm-Waterfall Methodology – The Boehm-Spiral Methodology Versions - The Booch Methodology – Object Modeling Technique (OMT) Rational Object Methodology- Clean room methodology
3	**Software Architecture:** Software Engineering Tools and Environments - Software Metrics – COTS Integration - Distributed, Internet-scale and Web-based Software Engineering
4	**Empirical Study of Software Tools and Methods:** Software Reengineering - Software Reuse - Software Safety – Enterprise Architectures, Zachman's Framework; Architectural Styles
5	**Software Design Patterns:** Architecture description languages - Product-line architectures; Component based development
6	**Case study:** Software Project management
7	**Tools for Software engineering:** Testing tools, Estimation tool, Planning tools

Learning Outcomes:-

1. A successful student will have acquired the skills to understand, develop, and analyze recognizers for SDLC.

2. The student will also be able to deploy efficient and methodical techniques for software designing and implementation.

Books Recommended:

1. Fundamentals of Software Engineering, Ghezzi, Jazayeri, Mandrioli; Pearson Education (2002)
2. Software Engineering, Sommerville; 6/E, Pearson Education (2006)
3. Software Engineering – A Practitioner's Approach, Roger S Pressman; MGH (2005)
4. Pattern-Oriented Software Architecture Volume 2: Patterns for Concurrent and Network ed Objects, Schmidt, Stal, Rohnert, and Buschmann; Wiley (2000)
5. Software Architecture in Practice, Len Bass, Paul Clements, Rick Katzman, Ken Bass, 2/E, Addiwon –Wesley Professional (2003)

FACULTY OF: Technology and Engineering
DEPARTMENT OF: COMPUTER ENGINEERING
SEMESTER: 2 **CODE**: PGCE202
NAME: Digital Image Processing (DIP)

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	70	2.5	30	1	100	30	20	50	150

Objectives:

- Cover the basic theory and algorithms that are widely used in digital image processing
- Expose students to current technologies and issues that are specific to image processing systems
- Develop hands-on experience in using computers to process images
- Develop critical thinking about shortcomings of the state of the art in image processing

Prerequisites:

- Fundamental knowledge of mathematics.

Course outline:

Sr. No.	Course Contents
1	**Digital Image Fundamentals:** Image Formation Model, Image Sampling and Quantization, Representation of Digital Images, Basic Relationship between Pixels, Distance Measures.
2	**Image Enhancement**: Spatial Domain Methods: Point Operators, Histogram Processing, Neighborhood Averaging, Averaging Of Multiple Images, Media Filtering, DFT, smoothing and sharping in spatial and frequency domain, Homomorphic filtering
3	**Image Restoration :** Degradation Model, Noise Models, Constrained Restorations, Inverse Filtering, Wiener Filter.
4	**Color Image Processing:** Colour models; Pseudo colour, Image processing, color transformation, segmentation**.**
5	**Wavelets And Multi-Resolution Processing:** Image pyramids, sub band coding, Harr transform; multi resolution expression, Wavelet transforms
6	**Image Compression & Coding:** Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG & MPEG Compression standard.
7	**Morphological Image Processing:** Erosion, dilation, opening, closing, hit or miss transformation, Basic Morphological Algorithms: hole filling, boundary extraction, connected components, thinning, thickening, skeletons
8	**Image Segmentation And Representation:** Detection Of Discontinuities, Point Detection, Line Detection, Edge Detection, Edge Linking, Hough Transformation, Thresholding, Basic Global and Local Thresholding, Region Based

	Segmentation, Simple Method of Representation, Signatures, Boundary Segments, Boundary And Regional Descriptors, Object Recognition And Tracking
9	**Advanced Photography:** Introduction to Image Cloning, Warping, Morphing, Imprinting, Watermarking, Super Resolution Image, Image Rendering.

Learning Outcomes:
At the end of this module the student should be well acquainted with the knowledge of Image Processing.

Books Recommended:
Text Books:
1. Digital Image Processing, Gonzalez Rafel C. and Woods Richard C.; Pearson Education, Prentice Hall of India, 2nd Ed. (2002)
2. Fundamentals of Digital Image Processing, Jain A.K., PHI, 1st Ed. (1989)

Reference Books:
1. Digital Image Processing, Pratt W. K, Prentice Hall, 1st Ed. (1989)
2. Digital Image Processing, Vol. 1 and 2, Rosenfold and Kak A.C, Prentice Hall, 1st Ed. (1986)

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 2 **CODE**: PGCE203
NAME: Language Processor Designing (LPD)

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		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 compilation process along with assemblers, linker and loader.

Prerequisites:

- Basic Awareness of compiler, Assembler, interpreter and C programming is required. Basic knowledge of Data Structure is required.

Course outline:

Sr. No.	Course Contents
1	**Language Processors** Language Processing Activities, Fundamentals of Language Processing, and Fundamentals of Language Specification, Data Structures used for Language Processing
2	**Overview of the assembly process** Design of two pass assembler- Single pass assembler- Macros – Macro definition and usage- schematics for Macro expansion – Design of a Macro pre-processor – Macro Assembler.
3	**Compilers and Translators** Structure of a compiler – lexical analysis - Lex and YACC Tools – syntax analysis – context free grammars – basic parsing techniques- top down and bottom up parsing. Syntax Directed Definitions and Translations, Type checking, Error Handling.
4	**Data descriptors** Static and Dynamic storage allocation – Storage allocation and access in block structured programming languages – Array allocation and access- Compilation of expressions – Handling operator priorities – Intermediate code forms for expressions –code generator.
5	**Control transfer** Conditional and Iterative constructs- Procedure calls – Code optimization – Optimization transformations – Local optimization and global optimization – Compiler writing tools – Incremental Compilers
6	**Linker & Loaders** Program relocatability – linking – various loading schemes – linkage editing – Design of linkage editor – dynamic loading – overlays – dynamic linking.

Learning Outcomes:

3. A successful student will have acquired the skills to understand, develop, and analyze recognizers for programming languages.
4. The student will also be able to deploy efficient and methodical techniques for integrating semantic analysis into the afore-mentioned recognizers, and generate low-level code for most constructs that characterize imperative and functional programming languages.

Books Recommended:

1. System Programming and Operating Systems, Dhamdhere; McGraw Hill
2. Compilers Principles Techniques And Tools Aho, Sethi, Ullman; Pearson Education Asia

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 2 **CODE**: PGCE204
NAME: Advance cryptography & Network Security (ANS)

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 Cryptography.
- To understand Network Security.

Prerequisites:

- Basic Knowledge of Networks/System

Course outline:

Sr. No.	Course Contents
1	**Introduction:** Threats, Vulnerabilities, Attacks, Integrity, Confidentiality, Anonymity, Authentication, Authorization, Non-repudiation, Data Security and Database Security
2	**Secret Key Cryptography:** DES, Triple DES, AES, Key Distribution, Attacks
3	**Public Key Cryptography:** RSA, ECC, Key Exchange, Attacks.
4	**Integrity, Authentication and Non-Repudiation:** Hash Functions, Message Authentication Code, Digital Signature
5	**Public Key Infrastructure:** Digital Certificates, Certification Authorities.
6	**Protocols:** Basic Authentication Protocols, Attacks, Needham Schroeder Protocol,Kerberos, Network Security with IP Security, Web Security using SSL, Ecash and Secure Electronic Transaction
7	**System Security using Firewalls and VPNs**
8	**Worms and Viruses**
9	**Miscellaneous:** Smart Cards and security, Zero knowledge protocols, Enterprise Application Security, Biometric Authentication, Database Access Control, Security and Privacy Issues in RFIDs

Learning Outcomes:

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

- Cryptography
- Network Security

- Protocols

Teaching & Learning Methodology:
The module will be delivered via lectures and assignments, and practical exposure. The assignments will be based on simulation/review, study of literature published in *IEEE* journals/transactions. Students are expected to undertake self-study for during the course-work and assignments preparation, and deliver presentations.

Books Recommended:
1. Cryptography and Network Security, William Stallings
2. Security in Computing, Pfleeger and Pfleeger; 3rd Edition, PHI
3. Computer Security: Art and Science, Bishop; Pearson Edition
4. Computer Security, Gollmall; Willey Publication
5. Network Security, Kaufman; Pearson Edition

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 2 **CODE**: PGCE205
NAME: Wireless Sensor Network (WSN)

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 gain knowledge about famous adhoc network and its topology and implementation

Prerequisites:

- Basic knowledge of computer network and protocols

Course outline:

Sr. No.	Course Contents
1	**OVERVIEW OF WIRELESS SENSOR NETWORKS** Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference Between mobile ad-hoc and sensor networks, Applications of sensor networks-Enabling Technologies for Wireless Sensor Networks
2	**ARCHITECTURES** Single Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts
3	**NETWORKING OF SENSORS** Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts S MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy Efficient Routing, Geographic Routing.
4	**INFRASTRUCTURE ESTABLISHMENT** Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.
5	**SENSOR NETWORK PLATFORMS AND TOOLS** Operating Systems for Wireless Sensor Networks, Sensor Node Hardware –Berkeley Motes, Programming Challenges, Node level software platforms, Node level Simulators, State centric programming.

Learning Outcomes:
Students are able make research project in this specific surrent area.
Teaching & Learning Methodology:
The subject should be teaching by series of lecture and laboratories practical with hands on assignments.

Books Recommended:

1. Protocols and Architectures for Wireless Sensor Networks, Holger Karl & Andreas Willig; John Wiley, 2005

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 2 **CODE**: PGCE206
NAME: Service Oriented Architecture (SOA)

Teaching & Evaluation Scheme:-

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

Objectives:
To learn basic architecture concept about service orientation and web service

Prerequisites:
Basic Knowledge of Web Programming, Database Concept and Enterprise Application

Course outline:
Service Oriented Architecture is a Design concept. The course deals with Architecture concept of SOA and web services. The Course also related with XML based protocol and web services protocol for enterprise and rapid business solution.

Sr. No.	Course Contents
1	Basic Concept of Service Orientation Concept, Fundamental SOA, Common characteristics of contemporary SOA, Common misperceptions about SOA, Common tangible benefits of using SOA, Common pitfalls of adopting SOA, Web Service Protocol Stack, Basic Concept of XML like DTD, XML Schema
2	What Is Service-Oriented Architecture?, Business-Driven SOA,SOA and Other Architectures, What Is a Service?, SOA Reference Architecture
3	Enterprise architectures -Integration versus interoperation , J2EE ,.NET, Model, Driven Architecture, Legacy System
4	Web Services and Primitive SOA, The Web services framework, Services as Web services, Service descriptions with WSDL, Messaging with SOAP,
5	Web Services and Contemporary SOA, Message exchange patterns,Service,activity,Coordination,Atomictransactions,Business activities, Orchestration, Choreography, Addressing, Reliable messaging, Correlation, Policies, Metadata exchange, Security, Notification and eventing
6	Principles of Service-Orientation, Service-orientation and the enterprise, Anatomy of a service-oriented architecture, Common principles of service-orientation, How service-orientation principles inter-relate, Service-orientation and object-orientation, Native Web service support for service-orientation principle,
7	Service Layers, Service-orientation and contemporary SOA,Service layer abstraction, Application service layer, Business service layer, Orchestration service layer, Agnostic services, Service layer configuration scenarios

8	SOA Planning and Analysis, SOA Delivery Strategies, Service-Oriented Analysis, Service-Oriented Analysis
9	Semantic web activity, Resource Description framework(RDF), RDFS

Learning Outcomes:

By completing the course of Service Oriented Architecture students are able to create Platform independent, programming language independent and vender independent software Application

Books Recommended:

1. Service-Oriented Architecture: Concepts, Technology, and Design, Thomas Erl; Prentice Hall
2. Applied SOA Service-Oriented Architecture and Design Strategies, Mike Rosen, Boris Lublinsky, Kevin T. Smith, Marc J. Balcer; Wiley Publishing Inc
3. Service-Oriented Computing Semantics, Processes, Agents, Munindar P. Singh, Michael N. Huhns; Wiley India
4. Service Oriented Architecture A Field Guide to Integrating XML and Web Services, Thomas Erl; Prentice Hall

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 2 **CODE**: PGCE207
NAME – Data Mining Technology (DT)

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	Hrs	Marks	Hrs					
4	0	2	6	30	1.5	70	2.5	100	30	20	50	150

Objectives:

- Compare and contrast different conceptions of data mining as evidenced in both research and application.
- Explain the role of finding associations in commercial market basket data.
- Characterize the kinds of patterns that can be discovered by association rule mining.
- Describe how to extend a relational system to find patterns using association rules.
- Evaluate methodological issues underlying the effective application of data mining.
- Identify and characterize sources of noise, redundancy, and outliers in presented data.
- Identify mechanisms (on-line aggregation, anytime behavior, interactive visualization) to close the loop in the data mining process

Prerequisites:
This Course needs the thorough understanding of Database Design and SQL

Course outline:

Sr. No.	Course Contents
1	**Introduction:** Fundamentals of data mining, Data Mining Functionalities, Classification of Data, Mining systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data, Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining,
2	**Data Preprocessing:** Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage
3	**Concepts Description: Characterization and Comparison:** Data Generalization and Summarization- Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.

4	**Mining Association Rules in Large Databases:** Association Rule Mining, Mining Single- Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.
5	**Classification and Prediction:** Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy
6	**Cluster Analysis Introduction:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model- Based Clustering Methods, Outlier Analysis.
7	**Mining Complex Types of Data:** Multidimensional Analysis and descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

Learning Outcomes:

At the end of this course the student should be able to

- Demonstrate the knowledge gained through solving problems particularly of data processing and analysis kind of work is transformed to better in elaboration and implementation phase during department level presentation.
- Use of data mining tools during Projects to build reliable products, the current demand of the industry.
- Research paper publications.

Books Recommended:

1. Data Mining – Concepts and Techniques, Jiawei Han & Micheline Kamber; Harcourt India.
2. Data Mining Techniques, Arun K Pujari; University Press
3. Building the Data Warehouse, W. H. Inmon; Wiley Dreamtech India Pvt. Ltd.

Reference Books:

1. Data Warehousing in the Real World , SAM Anahory & Dennis Murray; Pearson Education Asia.
2. Data Warehousing Fundamentals, Paulraj Ponnaiah; Wiley Student Edition
3. The Data Warehouse Life cycle Tool kit, Ralph Kimball; Wiley Student Edition
4. Data Mining Introductory and advanced topics, Margaret H Dunham; Pearson Education

C. U. SHAH UNIVERSITY

FACULTY OF: Technology and Engineering
DEPARTMENT OF: Computer Engineering
SEMESTER: 2 **CODE**: PGCE208
NAME: Real Time System (RTS)

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 provide understanding of real time system and their use in the development of embedded multitasking application software. It begins with the fundamental of processor and operating system and then focusing on scheduling, inter task communication and synchronization

Prerequisites:

- Programming in C, Operating Systems and basics of Computer Communication

Course outline:

Sr. No.	Course Contents
1	**Introduction:** Characteristics, Processor architecture, Inter task Communication and Synchronization Overview, Messages and Message Queues, Semaphores, Mutex
2	**Basics of Real-Time Task Scheduling:** Cyclic Scheduler, Event - Driven Scheduling, Rate Monotonic Scheduler, RMA Scheduling : Further Issues, Few Issues in Use of RMA
3	**Handling Resource sharing among real-time tasks:** Resource Sharing Among Real-Time Tasks, Highest Locker and Priority Ceiling Protocols, An Analysis of Priority Ceiling Protocol, Handling Task Dependencies, Scheduling Real-Time Tasks in Multiprocessor and Distributed systems
4	**Real-time operating systems:** General concepts, Unix and Windows as RTOS
5	**Real-Time Communication:** Few Basic Issues in Real - Time Communications, Real - Time Communication in a LAN, Performance of Real -Time Communication Protocols
6	**Kernel Topics:** Dynamic Memory Allocation and Fragmentation Issues, RTOS Timers, Relative and Absolute Timing, Asynchronous Signals, Device I/O Supervisor, Sockets Interface, Device Drivers, Interrupt Service Routines

Learning Outcomes:

1. Students are able to implement real world problems.

2. It is for practicing embossed systems software development and for the designing and implementing the software for real-time computer systems.

Books Recommended:

1. Real-Time Systems, Jane W. Liu; Pearson Education (2001)
2. Real-Time Systems: Theory and Practice, Rajib Mall; Pearson (2008)
3. Real-Time Systems, Krishna and Shin; Tata McGraw Hill (1999)