Bachelor of Science in Software Engineering

Course Description

Semester 1:

Course Code	CSC 103
Course Title	Introduction to Computers and Programming
Course Objectives	This course will provides an overview of computer hardware and software; and helps them to understand Programming in C with emphasis on modular and structured programming technique; Problem solving and algorithm development; Simple engineering and scientific problems.
Course Outline	This course covers computer hardware and software, C Programming language, flow charts, data types, variables, decision making if/else, switch, loops: for loop, while loop, do-while loop, arrays, multidimensional arrays, user defined functions, passing arrays to functions, recursive functions, structures, array of structures, string, pointers, preprocessor bit wise operators and File I/O (reading, writing, appending, modifying file content).

Course Code	EEE121
Course Title	Electric Circuit Analysis I
Course Objectives	This is the very first undergraduate course which is aimed to build an understanding of the concepts and ideas explicitly involved in the introductory electric circuit theory. The course is designed to emphasize the relationship between conceptual understandings and practical problem-solving techniques involved in the circuit theory. In short, the course will provide students with a strong foundation of electric circuit knowledge and practices.
Course Outline	Introduction, Basic Concepts of Electrical Quantities and their System of Units, Charge, Current, Voltage, Power & Energy, Circuit Elements, Simple Resistive Circuits, Constant Voltage & Constant Current Sources, Ohm's Law, Kirchoff's Laws, Analysis of Single-Loop and Single-Node Circuits, Resistance & Source Combinations, Current and

	Voltage Division, Nodal Analysis, Mesh Analysis, Linearity and Superposition, Source Transformation, Thevenin's and Norton's Theorems, Maximum Power Transfer Theorem, Reciprocity Theorem, Inductor, Capacitor & their Combinations, Calculations of Current, Voltage & Power, Source Free RL & RC Circuits, Unit Step Function, Driven RL Circuits, Natural & Forced Response of RL and RC Circuits, Transient and Steady-State Analysis, Time-Constants, Natural and Forced Response of Parallel and Series RLC Circuits, Transient and Steady-State Analysis, Over-Damped, Critically Damped and Under Damped RLC Responses.

Course Code	**HUM100**
Course Title	**English Comprehension and Composition**
Course Objectives	The course will help students in developing the competencies to understand English and express themselves effectively in the same language both in writing and speaking. This course is designed to improve students' abilities to paraphrase, summarize, and synthesize and to correctly and effectively express them. Students learn to write more effectively through a variety of assignments that highlight the writing and revision process, effective sentence formation, paragraph development, and the format of essays. This course will emphasize the use of correct grammar, spelling, punctuation, and mechanics. Students will be required to apply these skills to all writing assignments
Course Outline	This course will cover enhancing comprehension skills, basic Grammar, Advanced Sentence Structures (Dangling modifiers, Parallelism, Sentence fragments, Run-on sentences, Misplaced modifiers) Pre-writing Techniques(Free-writing, note keeping, brain storming, mind mapping, journalistic questions), Paragraph Writing(Definition, unity, topical sentence and supporting details), EssayWriting, Précis Writing, Message Composition, Word Skills, Presentation Skills.

Course Code	**HUM 110**
Course Title	**Islamic Studies**
Course Objectives	The subject introduces Islamic thought in comparison with other major world religions.

Course Outline	The topics included are beliefs and actions: Islam and other world religions, basic sources of teaching, obligations towards God, self and others, and Islamic teachings of collectivism.

Course Code	MTH104
Course Title	**Calculus and Analytical Geometry**
Course Objectives	At the end of this course the students will be able to manipulate, differentiate, and integrate exponential functions, logarithmic functions, inverse trigonometric functions, and hyperbolic trigonometric functions. Apply L'Hôpital's rule to find limits of indeterminate forms, use integration by parts, trigonometric substitution, partial fractions, determine convergence and divergence of infinite series. Use Maclaurin and Taylor series to approximate functions, find power series and determine radius and interval of convergence.
Course Outline	Inequalities, Functions, Shifting Graphs, Limits of Function, Continuity, Derivative of a Function, Application of Derivatives, Integration, Indefinite Integrals, Definite Integrals, Application of Integral, Area , arc-length, Transcendental Functions, L'Hopital's rule, Techniques of Integration, Improper integrals, Infinite Series, Limit of sequences of Numbers, Convergence and Divergence Tests, Alternating Series Test, Absolute and Conditional Convergence, Power series, Taylor's Series and M aclaurin Series, Convergence of Taylor Series: Error Estimates, Applications of Power Series.

Semester: 2

Course Code	CSC102
Course Title	**Discrete Structures**
Course Objectives	The course will help students to understand mathematical concepts for the mastery of some of the higher level computer science courses. Main purpose is to introduce the basic concepts (familiarity with mathematical notations, understanding of mathematical proofs) and applications of discrete mathematics.

Course Outline	This course introduces fundamental mathematical structures necessary for program logic and data structures. It covers topics on set theory, propositional and first order logic, proof techniques, graphs and tree structures, notions of implication, converse, inverse, contra positive, negation, and contradiction finite probability space , counting arguments, sum and product rule, inclusion-exclusion principle, number theory and discrete probability.

Course Code	CSC241
Course Title	**Object Oriented Programming**
Course Objectives	The course will help students to understand object oriented approach by developing solutions for range of problems using object oriented programming. They will also design and implement simple and multi threaded applications.
Course Outline	This course covers the concepts of object oriented programming paradigm, encapsulation, inheritance, polymorphism, abstract classes and interfaces, overloading and overriding, exception handling, packages, object-oriented design, event-driven programming, recursion, use of stacks, queues and lists from API.

Course Code	EEE231
Course Title	Electronics I (Support Sc. Elective I)
Course Objectives	This is a fundamental level course in electronic devices and circuit theory. The main objective of this course is to make students understand the construction, operation and modeling of semiconductor devices and to inculcate in them the ability to analyze and design various electronic circuits.
Course Outline	Solid State Theory, Introduction to Semiconductors Devices, Intrinsic and Extrinsic Semi-conductors, Electron Hole Pairs, Distribution of Electrons and Holes in a Semi-conductors, P.N. Junction Diode, Forward and Reverse Biasing, of a Diode, V-I Characteristics, Ideal & Practical Diodes, DC Load Line & Quiescent Conditions, Small Signal Analysis of Diodes, Dynamic Resistance, AC Resistance, Capacitance and Switching Response, Diode Circuits & Applications, Rectifiers and

	Clipping Circuits, Special Diodes and their Applications, Zener Diodes, LED, Photo Diode, Tunnel Diode, Temperature Effects and Derating Curves, BJT Transistors, Biasing Techniques, Common Base, Common Emitter (CE) and Emitter Follower (CC) Configurations, Current Flow Mechanism, Equivalent Circuits, Current Amplification, Power Calculations, Theory of the Operation of the FETs and MOSFETs, Types of FETs, FET Amplifiers and Biasing Techniques, Temperature Effects in BJTs & FETs, Bias Stability, Q Point Variations, Stability Factor Analysis and Control.

Course Code	**HUM102**
Course Title	**Report Writing Skills**
Course Objectives	This course has been specifically designed to meet the writing needs of students aiming for a specialization in areas of Management. The aims and objectives of this particular course are to introduce course participants the importance, needs, varieties, and technicalities of business reports. Also Their reading skills are further enhanced through exposure to a variety of graphical sources such as charts, graphs and diagrams. Students are taught presentation skills culminating in a PowerPoint presentation based on their term report
Course Outline	The course introduces fundamental of Technical Communication (Theories of Communication, ABC & Objectives of Technical Communication, 7 Cs of effective communication), writing process (stage 1, stage 2, stage 3), presentation skills, overview of technical documents (Writing memoranda & e-mails, overview of formal letters), basics of writing reports (Defining reports, determining the purpose & factors, gathering the information needed, interpreting the findings, Writing Short Informal Reports, Writing Long Reports, Understanding plagiarism, Referencing sources), designing the final project and presentation.

Course Code	**HUM111**
Course Title	**Pakistan Studies**
Course Objectives	The course seeks to provide an appreciation and understanding of the cultural, historical and socio-political heritage of Pakistan. Also how the

	constitution of Pakistan was formed and what type of constitutional issues were faced at the initial stages.
Course Outline	The course will cover culture, society and religion of Pakistan, Political and Constitutional Development (Shaping of the state structure; Objective Resolution; Constitutions of 1956, 1962 and 1973; Democracy and Authoritarianism), Cultural issues, Socio–Economic and Environmental issues in Pakistan (Unemployment; Double standard of education; Poverty; Gender issues; Population growth; Human right issues; Pollution issues.), Foreign Policy of Pakistan, Pakistan in the comity of the nations.

Course Code	**MTH105**
Course Title	**Multivariable Calculus (Support Sc. Elective II)**
Course Objectives	At the end of this course the students will be able to understand the graphs, their behaviors, the limits, differentiation and integration of the functions of more then one independent variable. Students will learn about 3-dimensions problems. Also they will use some new coordinate systems like cylindrical polar coordinates and spherical polar coordinates. It also include applications of integration like area, volume, line integrals etc.
Course Outline	Parameterization of Plane Curves, Polar coordinates, Graphing in Polar coordinates, Vectors in the Plane, Cartesian Coordinates and Vectors in Plane & Space, Dot Products and Cross Products, Cylindrical & Spherical Coordinates, Introduction to Vector Valued Function, Functions of Several Variables, Limits and Continuity, Differentiability, Partial Derivatives, Directional Derivatives, Maxima, Minima, Lagrange Mul tipliers, Double Integrals, Implicit Function Theorem, Applications, Triple Integrals, Triple Integrals in Cylindrical & Spherical Coordinates, Line Integrals.

Semester 3:

Course Code	**CSC110**

Course Title	Professional Practices (IT)
Course Objectives	This course is specifically designed to critically analyze and evaluate the consequences of computing on individuals, organizations and society. This course will help to examine the Information Technology professionalism, ethical decision making, codes of ethics. With the help of this students will analyze situations of computer use and technology and policy proposals, identifying the salient issues and evaluating the reasoning about them.
Course Outline	The topics covered: Impact of Computing on Society; Ethical Foundations; Governance and Regulation; Freedom of Speech; Intellectual Property(Foundations of intellectual property Copyrights, patents, and trade secrets); Privacy; Security; Professional Responsibility; Leadership challenge; Ethics for IT professionals and IT Users; Computer and Internet Crime(History and examples of computer crime hacking and its effects Viruses, worms, and Trojan horses Identity theft Crime prevention strategies Case study); Philosophical Framework , Professional Practice , Industrial issues ,Employer Employee Issues; Impact of IT on quality of life. Student has to complete a course project in this course.

Course Code	**CSC112**
Course Title	Algorithms and Data Structures
Course Objectives	Upon completion of this course, students will have the ability to: • Apply a wide variety of software construction techniques and tools, including state-based and table-driven approaches to low-level design of software • Design simple languages and protocols suitable for a variety of applications • Generate code for simple languages and protocols using suitable tools • Create simple formal specifications of low-level software modules, check the validity of these specifications, and

	generate code from the specifications using appropriate tools • Design simple concurrent software • Analyze software to improve its efficiency, reliability, and maintainability
Course Outline	• Basics of formal languages; syntax and semantics; grammars; Backus Naur Form. Parsing; regular expressions and their relationship to state diagrams • Lexical Analysis; tokens; more regular expressions and transition networks; principles of scanners • Using tools to generate scanners; applications of scanners. Relation of scanners and compilers • Parsing concepts; parse trees; context free grammars, LL Parsing • Overview of principles of programming languages. Criteria for selecting programming languages and platforms • Tools for automating software design and construction. Modeling system behavior with extended finite state machines • SDL • Representing concurrency, and analyzing concurrent designs

Course Title	Data Base System
Course Objectives	Main objective of this course is to develop understanding of all the concepts of Database Modeling & Development; to construct and model real world Database system using Oracle, SQL and Developer.
Course Outline	Data/Information & Processing; File based systems; Data Processing Modes; Types of Databases; Components of DBMS; History and objectives of the development of DBMS; Types of data models; Roles in the database environment; Database Architecture; Relational Algebra & Relational Calculus; Terminology of Relational Model; Associations/Relationships; Types of Keys; Data Integrity; Views; Indexes; Design & Administration; Database system development life cycle; Phases and types of database design; Data Administration & Database Administration; ER-Modeling using UML; Normalization; Handling Problematic & Redundant data; Functional Dependencies; Transitive Dependencies; Identifying Normal Forms; Writing SQL Commands; Creating & Indexing the Tables; Formatting Query Results into Reports; Usage of SQL-Plus.

Course Code	CSC291
Course Title	**Software Engineering I**
Course Objectives	The main objective of this course is to construct a solid foundation for understanding and application of principles, techniques and technologies utilized in the development of good software systems by individual or teams.
Course Outline	What is software engineering? Software lifecycle and process models, Software engineering tools and programming environments, Overview of software project management, Software requirements specification, Software design, Using APIs, Software verification and validation, and Software evolution. Software engineering tools for modeling such as: Visual Paradigm UML or Rational Rose will be covered in lab extensively covering flow-oriented modeling, behavioral modeling, scenario-base modeling and class modeling.

Course Code	HUM103
Course Title	**Communication Skills**
Course Objectives	This course is designed to develop student's reading, writing, listening and speaking skills at an advanced level through language experience, free writing, drafting, peer response, revising and editing.
Course Outline	This course will enable the students to organize messages that are appropriate to the audience and situation. Students improve oral communication skills for professional and social interaction through extensive pronunciation and conversational practice. Individual pronunciation assessments help students refine their language skills. Practice includes forming and communicating opinions on contemporary issues, developing formal and informal oral presentations and reports, giving and following directions. Through readings and written exercises, students learn how to form, communicate, and support their opinions and ideas in academic and professional settings. Students strengthen their reading skills and expand their vocabularies by reading and discussing a variety of adapted and authentic texts. They also may present findings in research reports.

Course Code	MTH231
Course Title	Linear Algebra
Course Objectives	The objective of the course is to provide a rigorous approach towards the solutions of linear models which involves more than one variable. The techniques discussed in this course can be implemented on a wide range of applications from physical world. The matrix algebra will be helpful in performing and understanding of matrix computations on a machine. The eigenvalues, eigenvectors, inner product spaces, orthogonality are useful concepts for the analysis of dynamical systems.
Course Outline	Systems of linear equations and matrices, determinants; vector and inner product spaces(Subspaces, Basis, Null Space, Column Space, Dimension and Rank, Change of Basis, Applications), **Dynamical Systems (**Eigenvalue and Eigenvectors of a Matrix, Diagonalization, Eigenvectos and Linear Transformations, Applications to Dynamical System) matrix representations of linear transformations(Linear Independence, The Matrix of Linear Trnasformation, Linear Models in Science, and Engineering.), eigen values and eigen vectors, Cayley-Hamlton Theorem. **Inner Product Spaces (**Length, Orthognal Sets, Orthonormal Basis, orthogonal Projections, The Gram-Schmidt Process, Applications to linear Models).

Semester: 4

Course Code	CSC221
Course Title	Computer Organization and Assembly Language
Course Objectives	To introduce the organization of computer systems and usage of Assembly Language for optimization and control. Emphases should be given to expose the low level logic employed for problem solving while using Assembly language as a tool.
Course Outline	Introduction of Computer Organization, Data Representation; Integer Arithmetic; Two's Complement (Multiplication and division); Floating Point Representation; Floating Point Arithmetic; Instruction Representation; Machine Instruction Characteristics; Type of Operands; Pentium And Power PC Data types; Objectives and perspectives of Assembly language, microprocessor bus structure: address, data and

control, memory organization and structure (segmented and linear models), addressing modes, introduction to Assembler and debugger; Introduction to registers and flags; Data Movement, Arithmetic and Logic, Programme Control, Subroutines, Stack and its operation, Peripheral Control; Interrupts, Interfacing with high level languages, Real-time application.

******* **CSC 330 E-Commerce (CS & SE Elective 1)**

Course Code	CSE305
Course Title	**Software Requirement Engineering**
Course Objectives	To understand Issues in Requirements Engineering, to understand and apply Requirements Engineering Process, to understand and use Requirements Elicitation and Specification, to understand and use Formal Techniques, to understand modeling and analysis of Non-Functional Requirements.
Course Outline	Definition of requirements engineering and role in system development, Fundamental concepts and activities of requirements engineering, Information elicitation techniques, Modeling scenarios Fundamentals of goal-oriented requirements engineering, Modeling behavioral goals, Modeling quality goals, Goal modeling heuristics, Object modeling for requirements engineering, Object modeling notations, Object modeling heuristics, Identifying objects from goals, Modeling use cases and state machines, Deriving operational requirements from goals, Requirements Specification, Requirements verification and validation. Management of inconsistency and conflict, requirements engineering risks, the role of quality goals in the requirements selection process, Techniques for requirements evaluation, selection and prioritization; Requirements management; Requirements traceability and impact analysis.

***** **Introduction to Management**

Course Code	MTH262
Course Title	**Statistics and Probability Theory**
Course Objectives	At the end of this course the students of Computer Sciences and Bio Informatics will be able to understand data analysis, modeling and predictions in their respective fields. The content of this course covers all the descriptive statistics and probability models along with some basic touch of regression analysis.
Course Outline	Introduction to statistics and statistical methods, Frequency Distributions & Representation of data, Measure of Central tendency, Measures of Dispersion, Probability theory, Counting Rules, Conditional Probability, Law of total probability and Bays Rule, Concept of Discrete and Continuous Random variable, Cumulative distributions, Joint probability Distributions, Uniform, Binomial and, Poisson, & Geometric Distributions, Uniform & Normal Distribution, Gamma, Exponential distributions, Simple linear Regression and fitting of Curves. Correlation study. Testing about population Mean, proportion for one sample and two samples. Confidence interval for population Mean, proportion for one sample and two samples.

Semester: 5

Course Code	CSC336
Course Title	**Web Engineering (CS and SE Elective II)**
Course Objectives	To provide students with conceptual and practical knowledge and skills required to develop web applications and web services.
Course Outline	Context of Web Engineering, Web architecture, Tier architecture, one tier, two tier and three tier, HTML, Tables, CSS, CSS, Forms Scripting Languages, Java scripting, AJAX,JSON, Dynamic Web Pages, PHP, PHP And Database

Course Code	CSC339
Course Title	**Computer Communication and Network**
Course Objectives	The course will cover computer networks in a top down manner starting from the application layer to data link layer. The course will be taught in the Internet perspective and will therefore cover the layers of the TCP/IP suite.
Course Outline	This course covers an introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching; TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP and WWW; Socket programming and network security; Transport layer: TCP and UDP; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical Layer: circuit switching, coding, multiplexing and transmission media.

Course Code	CSE303
Course Title	**Software Design and Architecture**
Course Objectives	An in-depth look at software design. Continuation of the study of design patterns, frameworks, and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs. Basics of software evolution, reengineering, and reverse engineering. Upon completion of this course, students will have the ability to: • Apply a wide variety of design patterns, frameworks, and architectures in designing a wide variety of software • Design and implement software using several different middleware technologies • Use sound quality metrics as objectives for designs, and then measure and assess designs to ensure the objectives have been met • Modify designs using sound change control approaches • Use reverse engineering techniques to recapture the design of

	software
Course Outline	Introduction: Putting Software Architecture in Context, Software Architecture as a Design Plan, Software Architecture as an Abstraction, Software Architecture Terminology, Four Views of Software Architecture, Loose coupling between Views, Engineering concerns addressed by different views, Using the four Views. Global Analysis: Overview of Global Analysis Activities. Analyze Factors. Develop Strategies. Analyze Organizational Factors. Begin Developing Strategies. Analyze Technological Factors. Continue Developing Strategies. Analyze Product Factors. Continue Developing Strategies. Conceptual Architecture View: Design Activities for the Conceptual Architecture View. Central Design Tasks: Components, Connectors, and Configuration. Final Design Task: Resource Budgeting, Traceability, Uses for the Conceptual Architecture View. Module Architecture View: Design Activities for the Module Architecture View. Central Design Tasks: Modularization and Layering, Final Design Task: Interface Design, Traceability, Uses for the Module Architecture View. Execution Architecture View: Design Activities for the Execution Architecture View. Central Design Tasks: Runtime Entities, Communication Paths, and Configuration, Final Design Task: Resource Allocation, Traceability, Uses for the Execution Architecture View. Code Architecture View: Design Activities for the Code Architecture View. Central Design Tasks, Final Design Tasks, Traceability, Uses for the Code Architecture View. Role of Architect: The Architect as a Key Technical Consultant, The Architect Makes Decisions, The Architect Coaches, The Architect Coordinates, The Architect Implements, The Architect Advocates, Software Architecture as a Career.

Course Code	**EEE440**
Course Title	**Computer Architecture**
Course Objectives	Main objective is to understand what computer architecture is, including main components of a computer system such as processor, memory, Input/Output (I/O) and how these subsystems interact with each other to form a computational system. We will study the assembly language and instruction formats of the MIPS processor and look at the relationship between assembly language and a high level language such as C. The labs will mainly be based on using a simulator for MIPS processor.
Course	Fundamentals of computer design, the implementation of datapath and

Outline	control of a processor, power, cost, performance, instruction set principles, instruction and arithmetic pipelines, dynamic and speculative execution, precise exception, memory hierarchy, multilevel caches, virtual memory, storage and I/O, multi-cores, multiprocessors, and clusters pipelining, multi-cycle implementation, cache memory, virtual memory and input/output subsystems. New trends in computer architectures.

Course Code	CSC322
Course Title	Operating System Concepts
Course Objectives	In this course students will be taught the fundamentals of operating systems. Different models of operating systems will be introduced.
Course Outline	This course introduces the fundamentals of operating systems design and implementation. Topics include history and evolution of operating systems; Types of operating systems; Operating system structures; Process management: processes (Process Scheduling; Operations on Processes.Examples of IPC Systems; Communication in Client-Server Systems. Concurrency/Multithreading Models; Multithreading synchronization issues; Thread Libraries; Operating System Example), threads, CPU scheduling, process synchronization; Memory management(File Concept; Access Methods; Directory Structure; File-System Mounting; File Sharing; Protection. File-System Structure; File-System Implementation; Directory Implementation; Allocation Methods; Free-Space Management; Mass Storage Structures) and virtual memory; File systems; I/O systems; Security and protection; Distributed systems; Case studies.

Course Code	MGT350
Course Title	Human Resource Management (Institutional Elective I)
Course Objectives	The objective of the course is to explore the central, strategic role that HR plays to make organizations more competitive.
Course Outline	This course will examines personnel management concept and practices including recruitment and selection of employees, equal opportunities, training and development, performance appraisals, compensations and benefits, and labor relations. This course has a special focus on globalization and work force diversity in the high performance organization.

Semester: 6

******* CSC 308   Advanced Website Authoring   (CS & SE Elective III)

******* CSC 444   Visual Programming   (CS & SE Elective V)

Course Code	CSC456
Course Title	Human Computer Interaction
Course Objectives	To introduce students how humans interact with computers and how they can make their applications more users friendly.
Course Outline	Background to human-computer interaction; Goals, Human input-output channels, Interaction device PACT: A framework for designing interactive systems, The process of human-centered interactive systems design, Task analysis (Goals, tasks and actions, Task analysis and systems design, Hierarchical task analysis, GOMS: a cognitive model of procedural knowledge, Structural knowledge, Cognitive work analysis, Understanding requirements, Participative design, Envisionment, Visual user interface design Multimodal user interface design , Designing websites, Evaluation.

Course Code	CSE299
Course Title	Software Construction
Course Objectives	Upon completion of this course, students will have the ability to: Apply a wide variety of software construction techniques and tools, including state-based and table-driven approaches to low-level design of software • Design simple languages and protocols suitable for a variety of applications • Generate code for simple languages and protocols using suitable tools • Create simple formal specifications of low-level software

	modules, check the validity of these specifications, and generate code from the specifications using appropriate tools • Design simple concurrent software • Analyze software to improve its efficiency, reliability, and maintainability
Course Outline	Basics of formal languages; syntax and semantics; grammars; Backus Naur Form. Parsing; regular expressions and their relationship to state diagrams Lexical Analysis; tokens; more regular expressions and transition networks; principles of scanners. Using tools to generate scanners; applications of scanners. Relation of scanners and compilers Parsing concepts; parse trees; context free grammars, LL Parsing Overview of principles of programming languages. Criteria for selecting programming languages and platforms. Tools for automating software design and construction. Modelling system behaviour with extended finite state machines SDL , Representing concurrency, and analyzing concurrent designs

Course Code	**CSE302**
Course Title	**Software Quality Engineering**
Course Objectives	The objective of this course is to make students have ability to understand and practice: How to assure and verify Quality, and the need for a culture of quality. Avoidance of errors and other quality problems. Inspections and reviews. Testing, verification and validation techniques using variety of tools, incorporation of feedback loop to support quality promotion. Process assurance vs. Product assurance. Quality process standards. Product and process assurance. Problem analysis and reporting. Statistical approaches to quality control.
Course Outline	Introduction to software quality assurance, The Quality Challenge, Quality Control v/s Quality Assurance, Quality Assurance in Software Projects (Phases), Principles and Practices, Quality Management, Quality Assurance and Standards, Quality Planning and Quality Control, Verification and Validation, Planning Verification and Validation, Critical System Validation, Reliability Validation, Safety Assurance, Security assessment, Inspections and reviews, Principles of software validation, Software verification, Planning for Software Quality Assurance, Software Quality Assurance (SQA) Plans, SQA-Organizational Level Initiatives, SQA Planning (Observations, Numbers, Results), Software Testing, Specification based test construction techniques, White-box and grey-box testing, Others comprehensive software testing techniques for SDLC, Control flow oriented test

	construction techniques, Data flow oriented test construction techniques, Clean-room approach to quality assurance, Product Quality and Process Quality, Standards for process quality and standards for product quality, Walkthroughs and Inspections, Structure, Checklist, Audits, Roles and Responsibilities (Reviews, Inspections, etc), How to make Reviews and Inspections most effective

***** **HUM320 Introduction to Sociology**

Semester: 7

Course Code	CSE348/CSC348
Course Title	**Intro. Systems Modeling and Design/Data Security and Encryption (CS & SE Elective IV)**
Course Objectives	This is an introductory course on the methods, algorithms, techniques, and tools of data security and cryptography. After studying the theoretical aspects of cryptographic algorithms and protocols, we show how these techniques can be integrated to solve particular data and communication security problems. This course material is of use to computer and communication engineers who are interested in embedding security into an information system, and thus, providing integrity, confidentiality, and authenticity of the documents and the communicating parties.
Course Outline	The course consists of three parts: mathematical background, cryptography, and network security. The first part (mathematical background) introduces the principle of number theory and some results from probability theory, including Primes, random numbers, modular arithmetic and discrete logarithms. The second part (cryptography) covers cryptographic algorithms and design principles, including conventional and symmetric encryption (DES, IDEA, Blowfish, Rijndael, RC-4, RC-5), public key or asymmetric encryption (RSA, Diffie-Hellman), key management, hash functions (MD5, SHA-1, RIPEMD-160, HMAC), digital signatures, and certificates. The third part (network security) deals with practical applications that have been implemented and are in use to provide network security, including authentication protocols (X.509, Kerberos), electronic mail security (S/MIME, PGP), web security and protocols for secure electronic

	commerce (IPSec, SSL, TLS, SET).

******* MGT 403   Entrepreneurship   (Institutional Elective II)

Course Code	CSC494
Course Title	**Software Project Management**
Course Objectives	The course covers management techniques to plan, execute and control software development projects. Upon completion, participants should be able to estimate and plan effectively monitoring process and perform a project risk assessment for a software development project. They will also study how software development is integrated with other business activities and how social and environmental factors impact development.
Course Outline	Introduction to project management concepts, tools, and techniques; project integration management; project planning, scope management, scheduling, budget control, human resource management, communication management, risk analysis and management, project quality management, and procurement management. MS-Project will be demonstrated and used as a tool for creating project management documents.

Course Code	CSC304
Course Title	**Formal Methods in Software Engineering**
Course Objectives	In this course students learn how to represent computing systems with both state-based and process algebra models. They specify computing systems formally, reason about specifications, and verify their properties. They connect specifications to programmers through refinement and decomposition. They use theorem proving and model checking tools
Course Outline	Introduction to formal specification, Transformational development, Specification analysis and proof, Programme verification, Objects and types: Sets and set types, Tuples and Cartesian product types, Bindings and schema types, Relations and functions, Properties and schemas, Generic constructions, The Z Language, Syntactic conventions, Schema references, Schema texts, Predicates, Schema expressions, Generics, Sequential Systems.

| ******* **MTH467** | **Operation Research** | **(Support Sc. Elective III)** |

| ******* **Domain Specific Elective 1** |

Semester: 8

Course Code	**CSC499**
Course Title	**Project**
Course Objectives	Main purpose of project is to show the abilities and talents that a student will acquire during the whole program and this project will be a two semester capstone project.
Course Outline	In first part of project student teams employ knowledge gained from courses throughout the program such as development of requirements, design, implementation and quality assurance to develop a software solution to a real-world problem from conception to completion. In this part students develop project plan, software requirement specification and software design document. In second part, students implement the design they produced in first part of project, test their code, and evaluate their final product.

******* **List of Elective courses is given in the scheme of studies.**