

B.Sc. in Software Engineering Study Plan

■ University Compulsory Courses 16 C.H

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■ University Elective Courses 9 C.H

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■ Faculty Compulsory Courses 27 C.H

Line No.	Code	Course	
901010	MATH101	CALCULUS(1)	3
901020	MATH102	CALCULUS (2)	3
1712310	CPE231	DIGITAL LOGIC DESIGN	3
1731011	CS101	INTRODUCTION TO PROGRAMMING	3
1731020	CS102	PROGRAMMING LAB	1
1731121	CS112	INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING	3
1732111	CS211	DATA STRUCTURES AND ALGORITHMS	3
1742000	CIIs200	PROFESSIONAL AND ETHICAL ISSUES IN COMPUTING	1
1742010	CIIs201	INTRODUCTION TO WEB DESIGN	1
1742011	CIIs201	INTRODUCTION TO WEB DESIGN (LAB)	0
1742280	CIIs228	FUNDAMENTALS OF DATABASE SYSTEMS	3
1762300	SE230	FUNDAMENTALS OF SOFTWARE ENGINEERING	3

■ Department Compulsory Courses 68 C.H

Line No.	Code	Course	
902331	MATH233A	PROBABILITY & STATISTICS (FOR COMPUTER SCIENCES STUDENTS)	3
902411	MATH241A	DISCRETE MATHEMATICS	3
1732841	CS284	ANALYSIS AND DESIGN OF ALGORITHMS	3
1733180	CS318	HUMAN-COMPUTER INTERACTION	3
1733750	CS375	OPERATING SYSTEMS	3
1743400	CIIs340	WEB APPLICATION DEVELOPMENT	3
1743401	CIIs340	WEB APPLICATION DEVELOPMENT (LAB)	0
1744421	CIIs442	BUSINESS DATA COMMUNICATION	3
1752010	NES201	COMMUNICATION SKILLS	3
1762100	SE210	JAVA PROGRAMMING	3
1762101	SE210	JAVA PROGRAMMING (LAB)	0
1762200	SE220	SOFTWARE MODELING	3
1762250	SE225	SOFTWARE ENGINEERING LAB (1)	1
1763100	SE310	VISUAL PROGRAMMING	3
1763200	SE320	SYSTEM ANALYSIS AND DESIGN	3
1763210	SE321	SOFTWARE REQUIREMENTS ENGINEERING	3
1763220	SE322	SOFTWARE DESIGN	3
1763230	SE323	SOFTWARE DOCUMENTATION	3
1763250	SE325	SOFTWARE ENGINEERING LAB (2)	1
1763900	SE390	PRACTICAL TRAINING	3
1764200	SE420	FORMAL METHODS IN SOFTWARE ENGINEERING	3
1764300	SE430	SOFTWARE TESTING	3

1764301	SE430	SOFTWARE TESTING (LAB)	0
1764310	SE431	SOFTWARE SECURITY	3
1764320	SE432	SOFTWARE ENGINEERING FOR WEB APPLICATIONS	3
1764400	SE440	PROJECT MANAGEMENT	3
1764910	SE491	GRADUATION PROJECT(1)	1
1764920	SE492	GRADUATION PROJECT(2)	2

■ Department Elective Courses 12 C.H

Line No.	Code	Course	
1733620	CS362	ARTIFICIAL INTELLIGENCE	3
1734870	CS487	SIMULATION & MODELING	3
1743020	CIIs302	FUNDAMENTALS OF MULTIMEDIA	3
1744210	CIIs421	DATABASE APPLICATIONS	3
1744211	CIIs421	DATABASE APPLICATIONS (LAB)	0
1744290	CIIs429	DATA MINING	3
1763010	SE301	SOFTWARE ENGINEERING ECONOMICS	3
1763820	SE382	SOFTWARE ENGINEERING TOOLS	3
1764110	SE411	COMPONENT-BASED SOFTWARE DEVELOPMENT	3
1764410	SE441	SOFTWARE QUALITY ASSURANCE	3
1764420	SE442	SOFTWARE MAINTENANCE & EVOLUTION	3
1764710	SE471	CLIENT/SERVER PROGRAMMING	3
1764720	SE472	EMBEDDED SOFTWARE ENGINEERING	3
1764730	SE473	LARGE SCALE SYSTEMS DESIGN	3
1764930	SE493	SPECIAL TOPICS IN SOFTWARE ENGINEERING(1)	1
1764940	SE494	SPECIAL TOPICS IN SOFTWARE ENGINEERING(2)	2
1764950	SE495	SPECIAL TOPICS IN SOFTWARE ENGINEERING(3)	3

TOTAL 132 C.H

*** For prerequisite & equivalent courses see the Courses' Description.**

B.Sc. in Software Engineering

Courses' Description

SE 210 Java Programming (3C, 2H, 3L)

Covers structured programming in Java object-oriented programming, inheritance, interfaces, polymorphism, over loading, Graphical User Interfaces (GUI), I/O streams, exceptions, multithreading, layout manager and applications including client-server. *Prerequisite: CS 112*

SE 220 Software Modeling (3C, 3H, 0L)

Introduction to the concepts of object-oriented software modeling (techniques and methodologies). A general modeling language (e.g., UML), structure modeling, behavior modeling, domain modeling, architecture modeling, model checking, limitations of modeling, validation of models, comparison of different approaches considering their advantages and disadvantages. An internal laboratory is included. *Prerequisite: CS 112*

SE 225 Software Engineering Lab. 1 (1C, 0H, 3L)

In this lab students will build software models using well-known software modeling tools such as IBM Rational Rose, or Microsoft Visio. *Prerequisite: SE 230*

SE 230 Fundamentals of Software Engineering (3C, 3H, 0L)

Develop a strong foundation in software engineering with this exploration of key development processes. Topics include process definition and maturity; the system development life cycle; software life cycles and methodologies; requirements analysis and specification; architectural design, integration and testing. *Prerequisite: CS 211*

SE 301 Software Engineering Economics (3C, 3H, 0L)

The course covers quantitative models of software lifecycle, cost-effectiveness analysis in software engineering, multiple- goal decision analysis, uncertainty and risk analysis, software cost estimation, software engineering metrics; and quantitative lifecycle management techniques. *Prerequisite: SE 230*

SE 310 Visual Programming (3C, 3H, 0L)

Fundamentals programming, new programming features such as, LINQ, Auto implemental properties, and implicitly typed variables. Object oriented programming concepts such as inheritance interfaces. GUI Graphics and Multimedia such as, WPF, XAML, and WINFORMS. WEB/DATABASE concepts such as, XML, LINO To XML, Database, SQL, LINO To SQL. *Prerequisite: CS 211*

SE 320 System Analysis and Design (3C, 3H, 0L)

An introduction to the system development life cycle. Emphasis on strategies and techniques of systems planning, analysis and design, documentation, implementation and evaluation. Students are expected to carry out group projects using the system development life cycle. *Prerequisite: SE 230 + CIS 228*

SE 321 Software Requirements Engineering (3C, 3H, 0L)

An introduction to concepts, methods, and tools for the creation of large-scale software systems. Methods, tools, notations, and validation techniques to analyze, specify, prototype, and maintain software requirements. Introduction to object-oriented requirements modeling, including use case modeling, static modeling, and dynamic modeling using the Unified Modeling Language (UML) notation. Concepts and methods for the design of

large-scale software systems. Fundamental design concepts and design modeling using UML notation. Students participate in a group project on software requirements, specification, and object-oriented software design. *Prerequisite: SE 320 + SE 220*

SE 322 Software Design (3C, 3H, 0L)

An overview of principles of object-oriented design through design patterns. A discussion of the design pattern alternatives. Software architecture frameworks. Software Architecture analysis and validation. An introduction to interface design. *Prerequisite: SE 320*

SE 323 Software Documentation (3C, 3H, 0L)

An overview of writing methods and practices that software engineers use to create software documentation. The software documentation process. Documenting for the programmer. Documenting system tests. Online documentation. Types of online documentation. User documentation. Types of user manuals. Style and layout. Tutorials. System documentation. Types of system documentation. *Prerequisite: SE 230*

SE 325 Software Engineering Lab. 2 (1C, 0H, 3L)

In this lab students should build a complete software system and its documentation such as requirements specification, risk analysis, design models, testing plans, and user manual. Student learns how to work as a team. *Prerequisite: SE 225*

SE 382 Software Engineering Tools (3C, 3H, 0L)

Developing models of systems & software; Verifying model properties; fixing wrong models; Generating systems from models—statically and dynamically; Extending generated parts – statically and dynamically; Composing parts (in sensible ways) – statically & dynamically; Adaptive, dynamic, service-oriented architectures; Automated testing techniques – proactive & reactive; Practical, realistic applications using these techniques. *Prerequisite: SE 230*

SE 390 Practical Training (3C)

Students will train in companies, factories, governmental agencies, private institutions, etc., in a pre-approved computer-related activity for a period of eight weeks under the supervision of a faculty member. *Prerequisite: Completing of 75 CHs*

SE 411 Component-Based Software Development (3C, 3H, 0L)

Introduces concepts and foundations of software component and component-based software development. Detailed study of engineering principles of modeling, designing, implementing, testing, and deploying component-based software architectures. Also explores state-of-the-art component technologies. *Prerequisite: SE 230*

SE 420 Formal Methods In Software Engineering (3C, 3H, 0L)

This course introduces the use of formal mathematical notation and reasoning in the software development process. These methods have applications in requirements specification, design and verification. Course topics include mathematical foundations, predicates, preconditions and post conditions, alternative notations, types of formal models, and the strengths and limitations of formal methods. *Prerequisite: SE 321 + MATH 241*

SE 430 Software Testing (3C, 2H, 3L)

Concepts and techniques for testing and modifying software in evolving environments. Topics include

software testing at the unit, module, subsystem, and system levels; automatic and manual techniques for generating test data; testing concurrent and distributed software; designing and implementing software to increase maintainability and reuse. *Prerequisite: SE 321*

SE 431 Software Security (3C, 3H, 0L)

Theory and practice of software security, focusing in particular on some common software security risks, including buffer overflows, race conditions and random number generation, and on identification of potential threats and vulnerabilities early in design cycle. Emphasizes methodologies and tools for identifying and eliminating security vulnerabilities, techniques to prove absence of vulnerabilities, ways to avoid security holes in new software, and essential guidelines for building secure software: how to design software with security in mind from the ground up and to integrate analysis and risk management throughout the software life cycle.

Prerequisite: CIS 442

SE 432 Software Engineering for Web Applications (3C, 3H, 0L)

Detailed study of engineering methods and technologies for building highly interactive web sites for e-commerce and other web-based applications. Presents engineering principles for building web sites that exhibit high reliability, usability, security, availability, scalability, and maintainability. Teaches methods such as client-server programming, component-based software development, middleware, and reusable components. *Prerequisite: CIS 340*

SE 440 Project Management (3C, 3H, 0L)

Introduce basic concepts such as the definition of a project, the nature of the project team, and the role of the project manager. Examines techniques related to project formation, acceptance, and funding. Covers the project life cycle, work breakdown structure (WBS), Gantt charts, network diagrams, scheduling techniques, and resource allocation/estimation including return on investment, cost/benefit analysis and earned value. Emphasizes the role of contingency management in planning. *Prerequisite: SE 320*

SE 441 Software Quality Assurance (3C, 3H, 0L)

This course covers a broad range of topics related to software quality assurance (SQA). The course will explore combined application of a variety of SQA components, including: SQA activities typically performed by external participants; extension of SQA activities to project schedules and budget control; SQA implementation issues, SQA risk management considerations; and costs associated with SQA. *Prerequisite: SE 322*

SE 442 Software Maintenance and Evolution (3C, 3H, 0L)

Introduction to Software Evolution, Maintenance and Reengineering. Reverse Engineering: Program Analysis, Architecture Recovery, Software Complexity and Maintenance Metrics, Program Visualization. Forward Engineering: Refactoring, Code Transformation, Web-enabling. Software Reengineering Strategies and Management. *Prerequisite: SE 230*

SE 471 Client/Server Programming (3C, 3H, 0L)

This course covers several aspects for client-server systems, including: client-server models, transaction processing, communications, programming, security, middleware, developments. *Prerequisite: SE 322 + CIS 442*

SE 472 Embedded Software Engineering (3C, 3H, 0L)

Architecture of embedded systems and explore the difference between embedded design and traditional software engineering. The special demands on embedded systems including real-time programming, portability, low power usage, and miniaturization approach. The course introduces models and architectures, and covers such topics as specification, system partitioning, design quality, and developing synthesizable models.

Prerequisite: SE 322

SE 473 Large Scale Systems Design (3C, 3H, 0L)

The course describes the lifecycle of computer systems, and explains how they may be specified, designed, and implemented. Systems analysis is presented as a way of gathering and structuring information such that the required specification corresponds closely to the users' requirements. Systems design is then presented as a technique for transforming the specification to a form in which it can be implemented. The course considers thoroughly the activities which are required and the tools which are available to manage commercial software development projects. Real case studies will be used to illustrate many of the tools and techniques introduced.

Prerequisite: SE 322

SE 491 Graduation Project I (1C)

Provides the senior student with the opportunity to undertake a substantial graduation project under the supervision of a faculty member. At least two weeks prior to registration, an interested student must submit to the department chair a written request for permission to select a project. The request is to include a preliminary description of the proposed project and the name of the supervising faculty member. During this course, the student is expected to specify and design the proposed system or software. *Prerequisite: Completing of 90 C.H*

SE 492 Graduation Project II (2C)

This is a continuation of SE 491, where the student implements, tests and presents the proposed system or software to a 3-member faculty committee that includes the project's supervisor. A written report is to be submitted to the department and committee. *Prerequisite: SE 491*

SE 493 Special Topics in Software Engineering I (1C)

This course should cover state-of-the-art problems and solutions in software engineering. *Prerequisite: Department approval*

SE 494 Special Topics in Software Engineering II (2C)

This course should cover state-of-the-art problems and solutions in software engineering. *Prerequisite: Department approval*

SE 495 Special Topics in Software Engineering III (3C)

This course should cover state-of-the-art problems and solutions in software engineering. *Prerequisite: Department approval*