Ajloun National University   جامعة عجلون الوطنية

Faculty of Information Technology

Department of
Software Engineering

Study Plan for the Bachelor's Degree
in Software Engineering
Academic year 2023/2024

Ajloun National University   جامعة عجلون الوطنية

Vision

Excellence and Leadership in delivering educational and research programs and curricula in Software Engineering to serve the community at the local, regional, and international levels.

Mission

The mission of the Software Engineering Department is to prepare specialists in constructing, designing, developing, testing, and documenting software environments using standardized methodologies and modern tools. This is achieved through providing a distinguished, pioneering, and stimulating scientific, research, and applied academic environment that fosters creativity and excellence. The department is committed to generating applied research projects that meet the needs of both the local and international job markets.

Goals

1. Prepare graduates with advanced skills in software development, covering areas such as design, implementation, testing, and documentation.
2. Foster a deep understanding of standardized methodologies and modern tools used in the field of software engineering.
3. Establish a rigorous academic and research environment that encourages creativity, innovation, and excellence.
4. Provide practical, hands-on experience through applied academic projects to bridge the gap between theoretical knowledge and real-world industry needs.
5. Equip students with the ability to critically analyze, evaluate, and solve complex problems in software engineering.
6. Ensure a comprehensive understanding of industry standards and practices, preparing graduates for successful integration into the local and international job markets.
7. Facilitate continuous learning and professional development through exposure to emerging technologies and trends in software engineering.
8. Contribute to applied research projects that address the evolving demands of the local and global software industry.
9. Promote collaboration and partnerships with industry leaders, research institutions, and the broader community to enhance the impact of the department's initiatives.

10. Strive to maintain and enhance the department's reputation for producing competent and sought-after professionals in the field of software engineering.

Learning Outcomes

Knowledge

The knowledge of software engineering principles, including understanding of software analysis and design, evaluation and testing and software quality and correctness.

Understanding of software engineering processes including, management of complex software development projects.

The knowledge of systems fundamentals, including architectures and organization, operating systems, networking and communication, parallel and distributed computation, and security

The knowledge of software development fundamentals, including data structures, algorithms, complexity, multiple programming languages, paradigms, and technologies.

Skills

An ability to analyze, design, verify, validate, implement, apply, maintain, and manage the development of software systems to meet desired needs within realistic constraints.

An ability to identify, formulates, and solve problems using software engineering .

An ability to use the techniques, skills, and modern tools necessary for software engineering practice.

An ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems

Competencies

An ability to function on multidisciplinary teams to communicate effectively.

Ability to develop software systems in one or more significant application domains

An ability to communicate with, and learn from, experts from different domains throughout their careers.

To Work collaboratively to apply the acquired knowledge, develop communication skills, and work in the team spirit via building smart projects.

Ajloun National University   جامعة عجلون الوطنية

Contents of the Study Plan

The study plan for the bachelor's degree in Software Engineering   and of (132) credit hours distributed as follows:

Certified On Campus learning (1+1, An hour and a half of on campus learning + one half hour of campus learning).

Certified Electronic (1+1, An hour and a half synchronous Electronic + campus learning).

Certified Blended (1+1, An hour and a half synchronous Blended + campus learning).

Number	Type of Requirement	Credit Hours	percentage%
First	University Requirements	27	20.45%
Second	Faculty Requirements	18	13.64 %
Third	Supportive Requirements	06	04.55 %
Fourth	Department Compulsory Requirements	69	52.27 %
	Department Elective Requirements	09	06.82 %
Fifth	Elective Free Requirements	03	02.27%
	Total	132	100%

University Coding System

Faculty Code	Department Cod	(Level Year)	Knowledge Area	Course sequence
3	13			

0 Remedial
1 First
2 Second
3 Third
4 Fourth

Knowledge Area

Knowledge Number	Knowledge Area	Number of Credit Hours
0	**Programming**	15
1	**Computer Science and algorithms**	12
2	**Main Computer Components**	12
3	**Applications and Information Science**	9
4	**Special topics in software engineering**	27
5	**Graduation Project**	3
6	**Field Training**	3

Ajloun National University جامعة عجلون الوطنية

First: University Requirements (27) Credit Hours

A. University Compulsory Requirement (12) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
704107	Entrepreneurship and Innovation	1			√	
704109	Leadership and Social Responsibility	1			√	
704116	Life Skills	1			√	
704117	English Language Skills (1)	2	714099	√		
704118	Arabic Language Skills (1)	2	704099		√	
704119	National Education	2	-		√	
704200	Military Sciences	3	-	√		

B. University Elective Requirements (15) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
201101	The Law in our Lives	3			√	
202132	Human Rights	3			√	
401100	Principles of Administration	3			√	
701140	Arab Library and Lexicography	3	-	√		
704103	International and Arab Contemporary Issues	3				√
704104	Islamic Culture	3	-	√		
704108	Integrity and Transparency	3			√	
704110	Digital Culture	3			√	
704112	Arabic Language Skills (2)	3	704118		√	
704113	Art of Rhetoric and Dialogue	3				√
704115	Development and Family Planning in Islam	3			√	
704141	History of Jerusalem	3			√	
704151	Computer Skills (1)	3	724099		√	
704152	Computer Skills (2)	3	704151		√	
704163	Foreign Language other than English	3			√	
704172	Sports and Health	3				√

Second: Faculty Requirements (18) Credit Hours

A. Faculty Compulsory Requirements (18) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
311100	Introduction to Computer Programming	3	-	√		
311101	Programming Language 1	3	311100			√
311202	Object-Oriented Programming	3	311101			√
311210	Discrete Mathematics for (I T)	3	601101			√
313160	Introduction to Software Engineering	3	-		√	
601101	Calculus 1	3	-		√	

Third: Supportive Requirements (6) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
601131	Principles of Statistics	3	-		√	
601372	Numerical Analysis 1	3	601101		√	

Fourth: Department Requirements (78) Credit Hours

A. Department Compulsory Requirements (69) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
311213	Data Structures	3	311202			√
311220	Digital logic design	3	311100			√
311314	Algorithms	3	311213			√
311340	Database Management System	3	313130			√
313130	Fundamentals of Databases	3	311100		√	
313142	Software Engineering Requirements	3	313160		√	
313220	Principle of Computer Networks	3	311220		√	
313221	Computer Organization and Architecture	3	311220	√		
313231	Systems Analysis and Design	3	313130	√		
313243	Software project management	3	313160		√	
313304	Internet Application Development	3	311202			√
313305	Visual Programming Applications	3	311202			√
313310	Software Intelligent Systems	3	311314			√
313340	Software Design	3	313142		√	
313341	Object-Oriented Software Engineering	3	313142			√
313342	Software testing	3	313340			√
313343	Software specifications	3	313341		√	
311422	Operating Systems for Software Engineering Students	3	311314		√	
313440	Software security	3	311220			√
313441	Software Documentation	3	313231		√	
313442	Software Maintenance and Development	3	313343		√	
313450	Graduation project	3	Pass 90 hours	√		√
313460	Field training	3	Pass 90 hours	√		

B. Department Elective Requirements (9) Credit Hours

Course code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
313204	Advanced programming	3	311101			√
313244	Multimedia systems	3	311101		√	
313245	Core approaches in software engineering	3	313160		√	
313246	Software components and architecture	3	313160		√	
313344	Internet Web Design	3	311101		√	
313345	Software Quality Assurance	3	313342		√	
313446	Software architecture	3	313341			√
313447	Secure software engineering	3	313340			√
313448	Software re-engineering and restructuring	3	313340			√
313449	Special Topics in Software Engineering	3	Pass 60 hours		√	

Fifth: Free Elective Requirements (03) Credit Hours

The students studies a free course offered by the university with (3) credit hours

Ajloun National University جامعة عجلون الوطنية

Advisement Plan for obtaining a bachelor's degree in Software Engineering

First Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311100	Introduction to Computer Programming	3	-
313160	Introduction to Software Engineering	3	-
601101	Calculus 1	3	-
-	University Compulsory Requirement	1	-
-	University Compulsory Requirement	2	-
-	University Elective requirement	3	-
	Total	15	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
311101	Programming Language 1	3	311100
313130	Fundamentals of Databases	3	311100
313142	Software Requirements Engineering	3	313160
601131	Principles of Statistics	3	-
-	University Compulsory Requirement	1	-
-	University Compulsory Requirement	2	-
	Total	15	

Second Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311202	Object-Oriented Programming	3	311101
311210	Discrete Mathematics for Information Technology Students	3	601101
311220	Digital logic design	3	311100
313220	Principle of Computer Networks	3	311220
-	University Compulsory Requirement	1	-
-	University Compulsory Requirement	2	-
-	University Elective Requirement	3	-
	Total	18	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
311213	Data Structures	3	311202
313221	Software components and architecture	3	313220
313231	Software Analysis and Design	3	313130
313243	Software project management	3	313160
-	Department Elective requirement	3	-
-	Free Elective Requirement	3	-
	Total	18	

Third Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311314	Algorithms	3	311213
311340	Database Management System	3	313130
313304	Internet Application Development	3	311202
313305	Visual Programming Applications	3	311202
313340	Software Design	3	313142
-	University Elective requirement	3	-
	Total	18	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
313310	Software Intelligent Systems	3	311314
313341	Object-Oriented Software Engineering	3	313142
313342	Software testing	3	313340
313343	Software specifications	3	313341
601372	Numerical Analysis 1	3	601101
-	Department Elective requirement	3	-
	Total	18	

Fourth Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
313422	Operating Systems for Software Engineering Students	3	311314
313441	Software Documentation	3	313231
313442	Software Maintenance and Development	3	313343
-	Department Elective Requirement	3	-
-	University Elective Requirement	3	-
	Total	15	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
313440	Software security	3	313220
313450	Graduation project	3	Pass 90 hours
313460	Field Training	3	Pass 90 hours
-	University Compulsory Requirement	3	-
-	University Elective Requirement	3	-
	Total	15	

Courses Description

Faculty Compulsory Requirements (18 Credit Hours)

Course Number	: 311100
Course Title	: **Introduction to Computer Programming**
Credit Hours	: 3
Prerequisites	: -

General concepts of problem-solving, program concepts, program flowcharts, variables and constants, data types, arithmetic and logical operations, solving problems using decision-making statements, solving problems using repetition statements, solving problems using logical case statements, programming functions, lists and arrays, linked sequences, sorting lists

Course Number	: 311101
Course Title	: **Programming Language 1**
Credit Hours	: 3
Prerequisites	: 311100

Fundamentals of programming, introduction to programming languages and their evolution, principles of programming in C++, variables and naming conventions, data types, arithmetic and logical operations, control statements, repetition statements, functions, arrays, introduction to object-oriented programming.

Course Number	: 311202
Course Title	: **Object-Oriented Programming**
Credit Hours	: 3
Prerequisites	: 311101

Object-oriented programming concepts and models, a review of control structures, data types, functions, arrays, and pointers, data abstraction, encapsulation and information hiding, class properties and associated operations, inheritance, and polymorphism, templates.

Course Number	: 311210
Course Title	: **Discrete Mathematics for Information Technology Students**
Credit Hours	: 3
Prerequisites	: 601101

Introduction to logic, propositional logic, conventional and unconventional proofs, sets, set operations, functions, countable and uncountable sets, integers and remainder arithmetic, sequences, series, mathematical induction, recursion, counting, permutations, combinations, probabilities, relations, graph theory, trees.

Course Number	: 313160
Course Title	: **Introduction To Software Engineering**
Credit Hours	: 3
Prerequisites	: -

Basic principles of systems engineering and software engineering, software development, planning and managing software projects, software requirements specification and processes, system modelling, preliminary software modelling, system architecture design, various methods of system and software design such as object-oriented design and distributed design, CASE tools for software engineering.

Course Number	: 601101
Course Title	: **Calculus 1**
Credit Hours	: 3
Prerequisites	: -

Functions, exponential and logarithmic functions, limits and continuity, differentiation, rules of differentiation, tangents and normals, the Mean Value Theorem and its applications, indeterminate forms ($0/0$, ∞/∞), horizontal and vertical asymptotes, local extreme values, concavity, graphing curves, definite integrals, the Fundamental Theorem of Calculus, indefinite integrals, integration by substitution, applications of definite integrals (area, volumes, volumes of revolution).

Supportive Requirements (6 Credit Hours):

Course Number	: 601131
Course Title	: **Principles of Statistics**
Credit Hours	: 3
Prerequisites	: -

Definition and uses of statistics, types of data and its collection methods, descriptive statistics: organizing and presenting data, summarizing data with tables, graphs, and numerical measures, measures of central tendency (mean, median, mode), measures of dispersion (range, quartiles and interquartile range, percentiles and percentile range, variance, and standard deviation), outliers, standard scores, Chebyshev's rule and the empirical rule, linear transformations in preparing descriptive statistics, definition of probability and its uses, elements of probability, counting methods, conditional probability, random variables, expectation and variance, computing probabilities and areas under the curves of discrete random distributions (binomial distribution) and continuous random distributions (normal distribution), Central Limit Theorem.

Course Number	: 601372
Course Title	: **Numerical Analysis 1**
Credit Hours	: 3
Prerequisites	: 601101

Mathematical preliminaries and error analysis, numerical methods for solving single-variable equations, numerical solutions for differentiation and integration, direct numerical methods for linear systems.

Compulsory Department Requirements (78 Credit Hours):

Course Number	: 311213
Course Title	: **Data Structures**
Credit Hours	: 3
Prerequisites	: 311202

Fundamental concepts, algorithm analysis and data representation methods, pointers and strings, queues, stacks, the structure of circularly linked lists, the structure of linearly linked lists, the structure of multiply linked lists, tree structures, sorting and searching algorithms

Course Number	: 311220
Course Title	: **Digital Logic Design**
Credit Hours	: 3
Prerequisites	: 311100

Digital Logic Design: Number systems, the binary system, Boolean algebra and basic logic gates, complex circuits, simplification of logic circuits, sequential circuits, flip-flops, registers, counters, memory, logic for information transfer between registers.

Course Number	: 311314
Course Title	: **Algorithms**
Credit Hours	: 3
Prerequisites	: 311213

Design, construction, and analysis of computer algorithms, growth of function values, execution time and efficiency of algorithms, self-recurring relations and their solutions, design and analysis of various sorting algorithms (insertion, merge, quicksort, heapsort), search algorithms in structures (breadth-first search and depth-first search), minimum spanning trees in structures.

Course Number	:	311340
Course Title	:	**Database Management System**
Credit Hours	:	3
Prerequisites	:	313130

Introduction to SQL, the Select statement, single-row functions, aggregate functions, displaying data from multiple tables, nested queries, creating a database, creating tables, constraints, basic concepts of PL/SQL, forms, reports.

Course Number	:	313130
Course Title	:	**Fundamentals Databases**
Credit Hours	:	3
Prerequisites	:	311100

Basic concepts and terminology of databases, database administrator, database management systems. Characteristics and methodologies of databases, three-level architecture of data schema, the entity-relationship model for database description: symbols and concepts. Concepts, constraints, and operations related to the relational model, relational algebra, building a database from entity-relationship models, introduction to SQL language, functional dependencies, simplification of database designs.

Course Number	:	313142
Course Title	:	**Software Engineering Requirements**
Credit Hours	:	3
Prerequisites	:	313160

The software engineering process, requirements gathering, functional and non-functional requirements, system services and constraints, quality of requirements - Requirements Traceability Matrix, measurements of non-functional requirements - Use case explanation, contextual diagrams and use case diagrams - Software requirements specification, IEEE standard - Requirements in rapid development methods, requirements for different systems: embedded systems, web systems, business management systems, and requirements management. Ethical behavior in software analysis will be discussed when collecting requirements with stakeholders.

Course Number	: 313220
Course Title	**: Prenciple of Computer Networks**
Credit Hours	: 3
Prerequisites	: 311220

Concepts and terminology in data communication and computer networks, physical and logical design of computer networks, network architecture, and media used for data transmission in computer networks. The OSI (Open Systems Interconnection) reference model, the TCP/IP reference model, the Physical Layer, the Data Link Layer, the Network Layer, the Transport Layer, the Session Layer, the Presentation Layer, the Application Layer. ALOHA protocol, CSMA protocols, local area networks (LANs), standard protocols, IEEE protocols (Token Ring, Token Bus, Ethernet), fundamentals of the Physical Layer and the Data Link Layer, frame protocols, error detection and correction, routing algorithms, data flow control in networks, congestion control algorithms in networks. Personal computer networks.

Course Number	: 313221
Course Title	**: Computer Organization and Architecture**
Credit Hours	: 3
Prerequisites	: 311220

Computer components and types, Central Processing Unit (CPU), instruction sets and formats, addressing methods, stacks, interrupts, CISC and RISC architectures, memory organization, memory hierarchy, methods of connecting memory to the CPU, associative memory, cache memory, memory organization Input and output.

Course Number	: 313231
Course Title	**: Systems Analysis and Design**
Credit Hours	: 3
Prerequisites	: 313130

Principles of systems, stages of system development life cycle, system analysis, preliminary investigations and gathering information about the system, feasibility study and cost of building systems, system development, presenting the system design and related and constructing data flow diagrams, implementation of system construction, testing and, system, Gantt chart and network diagram Models Developments: water full, OOP+ JAD+ RAD……….).

Course Number	:	313243
Course Title	:	**Software Project Management**
Credit Hours	:	3
Prerequisites	:	313160

Equipping students with the knowledge necessary to manage software and application projects. Topics covered include the basic principles of systems engineering and software engineering, software development processes, planning and managing software projects, resource and tools management and techniques, integration management and project planning, scope management, scheduling and budget monitoring, human resource management, communications management, risk analysis and management, quality management project, and procurement management.

Course Number	:	313304
Course Title	:	**Internet Application Development**
Credit Hours	:	3
Prerequisites	:	311202

This course aims to equip students with advanced issues in designing and implementing websites. Design and implementation of web-based applications, and fully database-driven websites. Advanced server-side programming (e.g., PHP), implementation of advanced server-side programming, and enhancing personal productivity concepts through web authoring. It also covers security, access rights, financial transactions.

Course Number	:	313305
Course Title	:	**Visual Programming Applications**
Credit Hours	:	3
Prerequisites	:	311202

Fundamentals of visual programming language, problem-solving, control and loop statements, language elements, event programming, data types, input and output, subprograms, functions, arrays, records, and file handling, with the practical aspect including the application of these concepts using the C# language.

Course Number	: 313310
Course Title	: **Software Intelligent Systems**
Credit Hours	: 3
Prerequisites	: 311314

This course provides an overview of the general principles of artificial intelligence, including search strategies, knowledge representation methods, search structures in state space, deductive and attributive logic, search strategies in state spaces, heuristic search, programming search methods, and generative systems. It also covers a number of research and applied areas in artificial intelligence, such as expert systems, machine learning, intelligent agents, and neural networks.

Course Number	: 313340
Course Title	: **Software Design**
Credit Hours	: 3
Prerequisites	: 313142

Introduction to structuring and designing complete software systems, building basic components and models. Topics include architectural principles, design documentation, and the relationships between levels of abstraction. Software architecture for specific fields and related models, communication mechanisms, real-time systems and distributed systems, general design, architectural methods, frameworks, and auxiliary models.

Course Number	: 313341
Course Title	: **Object-Oriented Software Engineering**
Credit Hours	: 3
Prerequisites	: 313142

Building software using an object-oriented language, with support for graphical user interfaces, complex data structures and specifications, design patterns, extraction techniques, procedures and data and iteration, type, polymorphism techniques, information hiding and layers, inheritance, exceptions, event systems, concurrency.

Course Number	: 313342
Course Title	: **Software Testing**
Credit Hours	: 3
Prerequisites	: 313340

This course aims to equip students with the knowledge necessary for systematic testing of software systems. Topics covered include: verification and validation of software, different types of white-box and black-box testing, debugging programs, quality assurance and measurement, predicting software reliability, project management, software maintenance, software reuse.

Course Number	: 313343
Course Title	: **Software specifications**
Credit Hours	: 3
Prerequisites	: 313341

Equipping students with the knowledge and skills necessary for software development, with a focus on analysis, design, and model construction. Topics covered include the basic principles of systems engineering and software engineering, software development processes, describing functional and non-functional software requirements and representing them using the standard model, models used in describing requirements, requirements specifications, processes of documenting and verifying requirements.

Course Number	: 313422
Course Title	: **Operating Systems for Software Engineering Students**
Credit Hours	: 3
Prerequisites	: 311314

Definition of an operating system, history of operating system development, types of operating systems, structure and functions of operating systems, processor scheduling, scheduling metrics, process management, threads, memory management, synchronization, critical section problem, deadlock situations, scheduling in multipurpose processors, management of input and output units, file management.

Course Number	: 313440
Course Title	**: Software security**
Credit Hours	**: 3**
Prerequisites	**: 313220**

Learning the basic principles related to the security of wired and wireless communication networks and computers. Covered topics include explaining network access control protocols, transport layer security in checks, wireless network security, email security, and protocols for verifying and authenticating internet users. Concepts, mechanisms, and application of information security. Teaching methods of attack and defense, and designing systems that resist them.

Course Number	: 313441
Course Title	**: Software Documentation**
Credit Hours	**: 3**
Prerequisites	**: 313231**

An introduction to software documentation activities during the software development process. Detailed guidelines for the documentation process include: institutional policies, document templates, introduction to international standards for software engineering document templates, professional techniques in designing, producing, and packaging software documents, producing user-friendly tutorials and help menus in documentation projects, practical training in writing software documentation.

Course Number	: 313442
Course Title	**: Software Maintenance and Development**
Credit Hours	**: 3**
Prerequisites	**: 313343**

This course covers four types of maintenance: corrective, adaptive, perfective, and preventive, along with the economic impacts of maintenance, and management issues related to system maintenance such as the organizational structure for maintenance, quality measurement, and related processes for change requests and configuration management. Topics include: on-site maintenance, the role of case tools; reverse engineering and restructuring, code restructuring and preventive maintenance. Students will also learn about different models of maintenance processes such as Boehm, Osborne's iterative enhancement, and object-oriented reuse methods. Students participate in a group project on software maintenance and development.

Ajloun National University   جامعة عجلون الوطنية

Course Number	: 313450
Course Title	: **Graduation project**
Credit Hours	: 3
Prerequisites	: Pass 90 hours

Students are expected to employ their accumulated knowledge and experience from the courses studied in this program by developing or working on their graduation project.

Course Number	: 313460
Course Title	: **Field training**
Credit Hours	: 3
Prerequisites	: Pass 90 hours

Students undertake training in either a government or private institution under the supervision of an academic advisor. During this training, students apply what they have learned during their university studies. The institution where the student is training fills out a pre-prepared report by the department to assess the trainee student.

Elective Department Requirements (9 Credit Hours):

Course Number	: 313204
Course Title	: **Advanced programming**
Credit Hours	: 3
Prerequisites	: 311101

Introduction to the Python programming language covering data types, control statements, loops, functions, arrays, an introduction to object-oriented programming, and graphical applications based on the user interface.

Course Number	: 313244
Course Title	: **Multimedia systems**
Credit Hours	: 3
Prerequisites	: 311101

Principles and modern technologies in the design of multimedia systems. Acquiring practical experience in this field. Topics include the design of multimedia systems, multimedia hardware and software, and issues in the representation, processing, and transmission of multimedia data such as text, graphics, sound, music, images, and video.

Course Number	: 313245
Course Title	: **Core Approaches in Software Engineering**
Credit Hours	: 3
Prerequisites	: 313160

This course presents goals, concepts, principles, methods, models, and tools in software engineering. Additionally, the course describes process models, planning and effort estimation, team organization, object-oriented analysis and design, software testing techniques, quality metrics, quality assurance, software management, and a comprehensive study of some software projects.

Course Number	: 313246
Course Title	: **Software components and architecture**
Credit Hours	: 3
Prerequisites	: 313160

Discussion of methods and techniques associated with software construction, detailed design methods and notations, implementation tools, coding standards and techniques, concepts and foundations of Component-Based Software Development (CBSD) and associated technologies, designing, building, assembling, and deploying commercially reusable software.

Course Number	: 313344
Course Title	: **Internet Web Design**
Credit Hours	: 3
Prerequisites	: 311101

Basic concepts in internet applications and web browsers, fundamentals of web design, web page languages, basics of XHTML language (texts, styles, colors, images, menus, tables, frames, and markup languages like VB Script and JavaScript), publishing websites, principles of website evaluation, web page building tools such as FrontPage and Dreamweaver.

Course Number	: 313345
Course Title	: **Software Quality Assurance**
Credit Hours	: 3
Prerequisites	: 313342

Equipping students with the knowledge necessary to verify software quality. Topics covered include software quality assurance, quality metrics, configuration management and verification, inspection and auditing processes, software process improvement models, process and product standards, internal and external quality attributes of software.

Course Number	: 313446
Course Title	: **Software architecture**
Credit Hours	: 3
Prerequisites	: 313341

The course covers the following areas: phases of software development, modeling and designing the system at the structural or architectural level, the principle of the methodology driven by the software system's structure, object-oriented analysis and design, contract-based design, design pattern principles, software development growth principle, software re-engineering, and reverse engineering techniques in software engineering.

Course Number	: 313447
Course Title	: **Secure Software Engineering**
Credit Hours	: 3
Prerequisites	: 313340

This course covers the development of secure software. Students should be able to ensure security at every stage of the software development life cycle, including the requirements phase and how to involve security requirements, the modeling phase and how to involve threat modeling, security programming guidelines, and testing.

Course Number	: 313448
Course Title	: **Software re-engineering and restructuring**
Credit Hours	: 3
Prerequisites	: 313340

Software maintenance through re-engineering; computer-based techniques for retrieving information from existing systems; re-analysis, restructuring, program transformations, reverse engineering of data, and goal-directed re-engineering.

Course Number	: 313449
Course Title	: **Special Topics in Software Engineering**
Credit Hours	: 3
Prerequisites	: Pass of 60 credit hours

Special, recent, and advanced topics in the field of software engineering are carefully selected and approved by the department.