Faculty of Computer Science and Informatics

Software Engineering Department

Study Plan of Bachelor's Degree in Software Engineering

Academic Year: 2021/2022

Department Vision

Distinction regionally in delivering highly qualified software engineers able to develop, maintain software, and efficiently lead software and academic projects using state-of-the art infrastructure.

Department Mission

Prepare qualified graduates in software engineering as to meet the needs of local and regional markets; capable of leading and accomplishing distinguished software and academic projects; capable of contributing to the development of infrastructures and promoting knowledge-based economy; and capable of developing and improving performance of local community organizations.

Department Objectives

1. Possess necessary skills of theoretical and applied knowledge in the field of Software Engineering.
2. Gain a professional competence and practice their profession with confidence and regional competitiveness with others.
3. Continue to lifelong learning and professional development amid future technological changes.
4. Be active members of teamwork with professional and ethical responsibilities, and know the needs of the community

Learning Outcomes

Graduates of the program will have an ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply system development methodologies in conformance with software quality standards. [SE]

Contents of the Study Plan

The bachelor's degree program in Software Engineering consists of 132 credit hours distributed as follows:

No	Requirement Type	Credited Hours	Percentage
First	University Requirements	27	20%
Second	College Requirements	23	17%
Third	Program Requirements	82	63%
Total		**132**	**100%**

University Coding System

4	0	3	–	Year	Term	–	–
College Code	Department Code		Knowledge Area	Course Level		Course Sequence	
Faculty of Computer Science and Informatics	**0 1** Masters in Computer Science **0 2** Computer Information System **0 3** Software Engineering **0 4** Mobile Computing **0 5** Cybersecurity						

Knowledge Areas

No	Knowledge Area	Credit Hours in the Study Plan
01	**Computer Science and Algorithms:** Discrete Mathematics, Data Structures, Algorithms.	9
02	**Programming:** Object Oriented Programming, Visual Programming, Web Application Programming	12
03	**Main Computer Components:** Digital Logic Design, Computer Organization and Architecture, Operating Systems, Computer Networks.	12
04	**Applications and Information Science:** Database, Database Systems Management, Systems Analysis and Design.	9
05	**Courses in Software Engineering:** Fundamentals ofSoftware Engineering, Software Specification and Design, Software Testing, Software Architecture, Software Development and Documentation, Software Project Management.	18
06	**Supporting Knowledge Areas:** Statistics, Numerical Analysis.	6
07	**Elective Courses:** Several courses within the sub-field of the program.	9
-	**Field training:** 3 hours after passing a minimum of 90 credit hours.	3
-	**Graduation Project:** 3 credit hours after passing 90 credit hours.	3
-	**Laboratories:** Several laboratories covering the needs and number of students.	-

First: University Requirements: 27 Credit Hours

A. University Core: 15 Credit Hours

Code	Course Name	Credit Hours	Prerequisite
50511102	Arabic Language 1	3	50511108
50511103	English Language 1	3	50511109
50511108	Arabic Language Basics	0	
50511109	English Language Basics	0	
50511110	Computer Basics	0	
50511206	National Education	3	
50511308	Military Sciences	3	
50541103	Computer Skills	3	50511110
Total		**15**	

B. University Elective: choose 12 Credit Hours from the following courses

Code	Course Name	Credit Hours	Prerequisite
50511204	Life Skills	3	
50511306	Entrepreneurship and Innovation	3	
50521101	Arabic Language 2	3	50511102
50521102	English Language 2	3	50511103
50521203	Principles of Psychology	3	
50521204	Human Rights	3	
50531101	Islamic Culture	3	
50531205	Jerusalem and the Hashemite Guardianship	3	
50541203	Environment and Society	3	
50541206	Health and Society	3	
50541307	Communication and Internet	3	
50541308	Foreign Language	3	

Second: College Core Requirements: 23 Credit Hours

Code	Course Name	CH	Th	Lab	Prerequisite
40212101	Data Structures	3	3	0	40421211
40241101	Fundamentals of Information Technology	3	3	0	
40241202	Databases	3	3	0	40241101
40241203	Laboratory of Databases	1	0	3	40241202 (co)
40312101	Discrete Mathematics	3	3	0	50551105
40322101	Websites Design	3	3	0	40241101
40421108	Introduction to Programming	3	3	0	
40421109	Laboratory of Introduction to Programming	1	0	3	40421108 (co)
40264401	Communication and Writing Skills	3	3	0	
Total		**23**	**21**	**6**	

Third: Program Requirements: 82 Credit Hours

A. Program Core: 67 Credit Hours

Code	Course Name	CH	Th	Lab	Prerequisite
40421211	Object Oriented Programming	3	3	0	40421108
40421212	Laboratory of Object Oriented Programming	1	0	3	40421211 (co)
40212202	Operating Systems	3	3	0	40212101
40213103	Algorithms Design and Analysis	3	3	0	40212101
40223101	Database Programming	3	3	0	40252201
40252201	Database Management Systems	3	3	0	40241202
40322202	Programming of Internet Applications	3	3	0	40241202+ 40322101
40322203	Visual Programming	3	3	0	40421211
40332201	Digital Logic Design	3	3	0	40312101
40333202	Computer Organization and Architecture	3	3	0	40332201
40342101	Systems Analysis and Design	3	3	0	40241202
40352201	Fundamentals of Software Engineering	3	3	0	40342101
40353102	Software Engineering Requirements	3	3	0	40342101
40353103	Software Project Management	3	3	0	40352201
40353204	Software Specifications and Design	3	3	0	40353205
40353205	Software Architecture	3	3	0	40352201
40354106	Human Computer Interaction	3	3	0	40322203
40354107	Software Engineering Tools	3	3	0	40353102
40354208	Software Development and Documentation	3	3	0	40354209
40354209	Software Testing and Quality Assurance	3	3	0	40352201
40384101	Field Training on SE	3	3	0	Complete 90 CH
40394203	Applied Graduation Project (1)	1	1	0	Complete 90 CH
40394204	Applied Graduation Project (2)	2	2	0	40394203
40433201	Computer Networks	3	3	0	40241101
Total		**67**	**66**	**3**	

B. Program Elective: 9 Credit Hours, choose from one of the following Tracks

Code	Course Name	CH	Th	Lab	Prerequisite
40354210	Special Topics in SE	3	3	0	Complete 60 CH
40354111	Software Design Patterns	3	3	0	40353204
40352212	Introduction to Data Science	3	3	0	40241202
40353213	Business Analysis	3	3	0	40342101
40354114	Software Security	3	3	0	40353204
40354215	Software Engineering Ethics	3	3	0	40352201
40354216	UI\UX Design	3	3	0	40322203

C. Support Courses: 6 Credit Hours

Code	Course Name	CH	Th	Lab	Prerequisite
50223121	Numerical Analysis	3	3	0	50551105
50551105	Principles of Mathematics and Statistics	3	3	0	
Total		**6**	**6**	**0**	

Advisory Plan

Year 1				
1st Semester (Fall)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
50551105	Principles of Mathematics and Statistics	3		
40264401	Communication and Writing Skills	3		
40421108	Introduction to Programming	3		
40421109	Laboratory of Introduction to Programming	1		40421108
40241101	Fundamentals of Information Technology	3		
	University Core Requirement	3		
Total		**16**		

2nd Semester (Spring)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
50223121	Numerical Analysis	3	50551105	
40421211	Object Oriented Programming	3	40421108	
40421212	Laboratory of Object Oriented Programming	1		40421211
40241202	Databases	3	40241101	
40241203	Laboratory of Databases	1		40241202
40322101	Websites Design	3	40241101	
	University Core Requirement	3		
Total		**17**		

Year 2				
1st Semester (Fall)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
40312101	Discrete Mathematics	3	50551105	
40212101	Data Structures	3	40421211	
40322202	Programming of Internet Applications	3	40241202+ 40322101	
40342101	Systems Analysis and Design	3	40241202	
	University Elective Requirement	3		
Total		**15**		

2nd Semester (Spring)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
40332201	Digital Logic Design	3	40312101	
40322203	Visual Programming	3	40421211	
40352201	Fundamentals of Software Engineering	3	40342101	
40353102	Software Requirements Engineering	3	40342101	
40433201	Computer Networks	3	40241101	
	University Core Requirement	3		
Total		**18**		

Year 3				
1st Semester (Fall)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
40213103	Algorithms Design and Analysis	3	40212101	
40354106	Human Computer Interaction	3	40322203	
40354107	Software Engineering Tools	3	40353102	
40252201	Database Management Systems	3	40241202	
	Program Elective Requirement	3		
	University Elective Requirement	3		
Total		**18**		

2nd Semester (Spring)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
40333202	Computer Organization and Architecture	3	40332201	
40353205	Software Architecture	3	40352201	
40354209	Software Testing and Quality Assurance	3	40352201	
40223101	Database Programming	3	40252201	
	University Elective Requirement	3		
	Program Elective Requirement	3		
Total		**18**		

Year 4				
1st Semester (Fall)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
40212202	Operating Systems	3	40212101	
40353103	Software Project Management	3	40352201	
40353204	Software Specification and Design	3	40353205	
40394203	Applied Graduation Project (1)	1	Complete 90 CH	
	University Core Requirement	3		
	Program Elective Requirement	3		
Total		**16**		

2nd Semester (Spring)				
Code	**Course Name**	**Credit Hours**	**Prerequisite**	**Corequisite**
40354208	Software Development and Documentation	3	40354209	
40394204	Applied Graduation Project (2)	2	40394203	
40384101	Field Training on SE	3	Complete 90 CH	
	University Core Requirement	3		
	University Elective Requirement	3		
Total		**14**		

Courses Description

40212101 Data Structures
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40421211 Object Oriented Programming)
Basic concepts of data structure and algorithm. The topics that will be covered in this course concerning Data type and structures; Abstract data types and encapsulation; Stacks; Queues; Recursion; Linked Lists; Binary trees; General trees; File organization: sequential and indexed files; Graphs: representation, traversing, shortest path; Sorting: exchange, insertion, quick sort, heap and others; Searching. At the end of this course, students will be able to select the proper data structure and algorithm to solve a specific software problem, the course includes complete a practical project or research by the students.

40241101 Fundamentals of Information Technology
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: -)
Knowledge of the terminology, information systems environment, processes, and components associated with information technology, information systems concepts, components, tools, and applications. It will provide an introductory understanding of computer hardware, numbering system and knowledge of how data is prepared for computer, instruction processed at a basic machine level, and software (operating systems, database, and web development and applications). It also introduces the networking, Internet, and the basics of the information security, web searching, in addition to algorithms and problem solving, the course includes complete a practical project or research by the students.

40241202 Databases
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40241101 Fundamentals of Information Technology)
Basic concepts of databases and the main topics such as: database definition, database system; overview of database management, database system architecture, introduction to relational model, database algebra, database design, database integrity, an introduction to structured query language (SQL), mapping between ER- and EER-to-Relational, the course includes complete a practical project or research by the students.

40241203 Laboratory of Database
(1 Credit Hours, Lecture: 0, Lab: 3, Corequisite: 40241202)
A practical laboratory in databases, covering practical exercises in database system and database management (relational database systems RDBMS, structured query language (SQL), and schema design techniques), the course includes complete a practical project or research by the students.

40312101 Discrete Mathematics
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 50551105 Principles of Mathematics and Statistics)
Fundamental aspects of discrete mathematics used in computer science starting with propositions, logical operations, truth tables, set theory, relations and functions, and methods of proofs. The course also introduces the concepts of sequences, matrices, lattices, graph theory, and trees (rooted tree, subtree), the course includes complete a practical project or research by the students.

40322101 Websites Design
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40241101 Fundamentals of Information Technology)
Basic concepts of the World Wide Web, internet technology, current Web protocols, and client-server programming for desktop computers and smart phones. Students will learn standard Hypertext Markup Language (HTML) for create the web pages, basics of Cascading Style Sheets (CSS) for design and layout the web pages, as well as JavaScript, together with XML and JSON for data-interchange and Ajax technology for building rich internet applications for desktop computers and smart phones. Students will apply their gained knowledge in a series of practical assignments. At the end of this course, students will create and maintain a small web page project on a live web server for desktop computers and mobile devices.

40421108 Introduction to Programming
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: -)
The fundamental concepts of programming using selected language. It covers basic structures of programming concepts such as variables, data types, control structures, arrays, functions, and pointers. A brief introduction to classes and objects is also given. Students will apply their gained knowledge in a series of assignments. Practical work for three hours weekly is included. The course includes complete a practical project or research by the students.

40421109 Laboratory of Introduction to Programming
(1 Credit Hours, Lecture: 0, Lab: 3, Corequisite: 40421108)
A practical laboratory in programming using selected language, where it covers practical exercises in the basics of programming such as variables, data types, control statements, matrices, functions and indicators. In this course, students apply their knowledge through a series of practical assignments in the laboratory.

40264401 Communication and Writing Skills
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: -)
Concepts of administrative communication and to develop some of the skills he needs in his private life and career, in addition to his definition of the basic concepts of communication as a core and vital in the life of business organizations. To achieve this, the course will deal with the following topics: the nature, importance and objectives of the communication process, trends, elements and channels of communication, obstacles to effective communication, the basis of successful correspondence writing. In addition to the recognition of listening skills and teamwork and the management of meetings and interviews, the course includes complete a practical project or research by the students.

40421211 Object Oriented Programming
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40421108 Introduction to Programming (C++))
Object-oriented concepts (encapsulation, data abstraction, inheritance, and polymorphism) along with OO design using UML (unified modeling language). The OOP concepts covered using JAVA programming language. The course emphasizes on the concepts of classes, templates, friend classes, inheritance, abstract class and virtual functions, exceptions, and generic programming. Upon completion, students should be able to use an object-oriented language to develop rather complex programs, the course includes complete a practical project or research by the students.

40421212 Laboratory of Object Oriented Programming
(1 Credit Hours, Lecture: 0, Lab: 3, Corequisite: 40421211)
A practical laboratory in object-oriented programming, covering practical exercises in object-oriented programming (encapsulation, data abstraction, inheritance, polymorphism). The course is concerned with applying concepts of classes (classes and templates, friendly classes, inheritance, abstract layer and virtual functions, exceptions and general programming in a practical way). Students will apply their knowledge through a series of practical assignments in the laboratory.

40212202 Operating Systems
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40212101 Data Structures)
The definition and role of the operating systems. Topics spanned functionality and structuring methods of a typical operating system; Introduction to modern operating systems, including device control, interrupts, synchronization and inter-process communication, process scheduling, memory management and virtual memory, disk management, and security. The course includes complete a practical project or research by the students.

40213103 Algorithms Design and Analysis
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40212101 Data Structures)
Basic concepts of designing and analyzing algorithms. Topics covered: review of abstract data types and data structures, definition of algorithms, classifying functions and computational complexities of algorithms, algorithms analysis & design techniques including: divide and conquer greedy methods, searching and sorting, trees, graphs, hashing, combinatorial algorithms and P/NP problems, the course includes complete a practical project or research by the students.

40223101 Database Programming
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40252201 Database Management Systems)
The use of DB Language (Oracle or SQL Server) to construct a database system. The students will learn how to use the various support tools for business applications (e.g., DDL and DML command, forms design, and trigger). At the end of this course, students will be able to install Oracle or SQL Server Database, Back up and recover data, Administer users and manage data, Transport data between databases, Understand the Oracle or SQL Server database architecture and how its components work and interact with one another, Use performance monitoring, database security, user management, and backup/recovery techniques. The course includes complete a practical project or research by the students.

40252201 Database Management Systems
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40241202 Databases)
The principles, design, implementation, architecture and applications of DBMS; Advanced Structured Query Language (SQL) such as: views, exit, with, create type, authorization, metadata, dynamic SQL, triggers, recursion; data dictionary; Normalization processes: 1NF, 2NF, 3NF and BCNF; DB Security; Modern DBMSs: Object-Oriented DBMSs; Physical Database design; Centralized and distributed Database systems. Advanced databases topics: Storage and File Structure, Indexing and Hashing, Transactions, Concurrency Control, and UML, the course includes complete a practical project or research by the students.

40322202 Programming of Internet Applications
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40322101 Websites Design + 40241202 Databases)
The knowledge and the tools to design and implement internet web applications for desktop computers and smartphones using PHP language as a server-side language. Initially, the course will introduce HTML language and web applications. Students will learn about concepts of PHP, functionality of web server, install and configure Apache HTTP server or Microsoft IIS. This course goes over the syntax and usage of PHP language such as data types, operators, arrays, control statements, expressions, sessions, cookies, as well as create programs that interact with MySQL databases. At the end of this course, students will create and maintain a small web application project on a live web server for desktop computers and smartphones. The course includes complete a practical project or research by the students.

40322203 Visual Programming
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40421211 Object Oriented Programming)
Fundamental concepts of visual programming (VP). Student will learn about VP concepts, event driven, and how to use VP to construct graphical user interface using Visual Basic.NET (VB.NET). This course covers an introduction to programming concepts and methods including the problem analysis and problem-solving techniques. Also, Data types, control structures, functions, syntax and semantics of the language, classes, class relationships, and exception handling will be covered. Connect to database could be covered, the course includes complete a practical project or research by the students.

40332201 Digital Logic Design
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40312101 Discrete Mathematics)
Introductory knowledge and basic concept to boolean logic and combinational circuits. Analysis of switching devices, minimization techniques, number systems and codes and logic design of functional digital units are also included. Furthermore, the use of LSI in logic design, an introduction to sequential circuits design of synchronous, asynchronous, and pulse sequential circuits, minimization of sequential circuits and state assignment are involved, the course includes complete a practical project or research by the students.

40333202 Computer Organization and Architecture
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40332201 Digital Logic Design)
Principles of computer organization and architecture concepts covers the following topics: computer system hardware organization and architecture; instruction set architectures; addressing modes; register transfer notation; processor design and computer arithmetic; memory systems; hardware implementations of virtual memory, and input/output control and devices, the course includes complete a practical project or research by the students.

40342101 Systems Analysis and Design
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40241202 Databases)
Main concepts of the system development life cycle. Information gathering and reporting activities from the analysis phase through the maintenance and support phase will be covered. At the end of this course, students will be able to design, implement, and document the system development cycle. The main topics that will be covered are: introduction to systems development; development life cycle; system development feasibility; development of fact finding methods; context diagram; data flow diagram; decision tables and trees; data dictionary; installation; training; development tools: documentation, maintenance, conceptual design, DB design, reverse engineering, graphical user interface, systems life cycle, system conversion, system charts and flow of control. Case studies are used to emphasize the points covered, the course includes complete a practical project or research by the students.

40352201 Fundamentals of Software Engineering
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40342101 Systems Analysis and Design)
Knowledge of the Information Systems environment and develops strong foundation by covering topics including: Planning, requirements, analysis and specification, design; testing; debugging; maintenance; and documentation, the course includes complete a practical project or research by the students.

40353102 Software Requirements Engineering
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40342101 Systems Analysis and Design)
Introduction to the detailed concepts and principles of software requirements engineering process and most common methods and tools, validation techniques to analyze and specify prototypes and maintaining software requirements. Topics include requirements elicitation, prototyping, functional and non-functional requirements, object-oriented techniques, and requirements tracking, the course includes complete a practical project or research by the students.

40353103 Software Project Management
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40352201 Fundamentals of Software Engineering)
Information systems project environment, project management phases, issues and techniques of project management, project evaluation and selection, scope of management, team building, stakeholder management, risk assessment, scheduling, quality, rework, negotiation, and conflict management. Professional issues including career planning, lifelong learning, software engineering ethics, and the licensing and certification of software project professionals, the course includes complete a practical project or research by the students.

40353204 Software Specifications and Design
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40353205 Software Architecture)
Fundamentals of developing software requirements specification as abases of software design using modern design patterns. Students will learn how to approach software development systematically and how standardized notation such as the Unified Modeling Language (UML) allows to map out the functionality of an application before writing any code. This course enhances good practices for defining classes and methods so that the applications run efficiently and are easier to maintain, the course includes complete a practical project or research by the students.

40353205 Software Architecture
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40352201 Fundamentals of Software Engineering)
Software architectural design and pattern with applying software architecture quality attributes; discusses the most common software architectures, their qualities, and tradeoffs. As well as how architectures are evaluated, what makes a good architecture, and its related improvements. In addition, the course presents important new tools and techniques related to the software architecture life cycle including the design philosophy, testing of software architecture, and current technologies used such as cloud programming architecture, and social networks, the course includes complete a practical project or research by the students.

40354106 Human Computer Interaction
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40322203 Visual Programming)
Introduction to the subject of Human-Computer Interaction (i) Specifying, Designing, Programming, and Implementing Graphical User Interfaces, Human-Centered Software Evaluation, Human-Centered Software Development; (ii) HCI Aspects of Multimedia Systems and Web-based Systems. The focus will be on (i) Understanding Human Behavior with Interactive Objects; (ii) Knowing how to develop and evaluate interactive software using a Human-Centered Approach; (iii) General Knowledge of HCI Design Issues with multiple types of interactive software, the course includes complete a practical project or research by the students.

40354107 Software Engineering Tools
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40353102 Software Requirements Engineering)
Software engineering methods and modern tools used in current software engineering projects. Beyond state-of-the-art technology and current trends, it also provides them with a discussion of visions and possible future trends of software development. Likewise, it will provide them with explanation of how tools support several activities in a software engineering life cycle; tools for managing work products, for requirements engineering, design, coding, testing, version control, configuration management, deployment, and documentation are considered, as are tools for project management and tracking. Therefore and after summarizing the features of each software engineering tool on a conceptual level, student can be able to estimate the potential risks and rewards of various software tools to decide which is best suited for their task, the course includes complete a practical project or research by the students.

40354208 Software Development and Documentation
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40354209 Software Testing and Quality Assurance)
Traditional and modern software development methods and techniques associated with software construction. Topics include detailed design methods and notations, implementation tools, coding standards and styles, and maintenance issues. Introduces major concepts of software documentation. Emphasis on construction of software system artefacts that support team development and evolution of software systems (e.g., memos, letters, project proposals, progress report s, requirements, specifications, design, test plans, test reports, project reports), the course includes complete a practical project or research by the students.

40354209 Software Testing and Quality Assurance
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40352201 Fundamentals of Software Engineering)
Software verification and validation (V&V) process, applying software quality assurance (SQA) and control management (SQM) in testing phase of SDLC. Covers software V&V; black-box and white-box testing; integration and regression testing; and selected topics from the following: object-oriented software testing, acceptance testing, conformance testing, diagnostic testing, test execution, distributed systems testing, test languages and test tools, GUI testing, interoperability testing, test metrics, and standards for software quality and testing, the course includes complete a practical project or research by the students.

40384101 Field Training on SE
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: Complete 90 Credit Hours)
Training is required for each student in one of organizations for not less than 8 weeks and 200 hours of training, the practice regulations are according to the training regulations issued and approved by the department, collage and dean's council of the university.

40394203 Applied Graduation Project (1)
(1 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: Complete 90 Credit Hours)
Phase 1 (Analysis and Design), Applied project includes theoretical and practical practices related to the current problems and applications in Software Engineering, applied research oriented, technical report, and presentation.

40394204 Applied Graduation Project (2)
(2 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40394203 Applied Graduation Project (1))
Phase 2 (Implementation), Applied project includes theoretical and practical practices related to the current problems and applications in Software Engineering, applied research oriented, technical report, and presentation.

40433201 Computer Networks
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40241101 Fundamentals of Information Technology)
Key Concepts of Computer Networks; Broad Range of Topics in Networking (e.g. Networks Applications, Network Classifications and Topologies, Network Layers, Channel Performance Measures, Transmission Media, Communication Network Protocols and Architecture); Data Link Layer (e.g. Framing, Error Detection and Correction, CSMA/CD, LAN IEEE Standards); Network Layer (e.g. IP service model, IP Addressing, Sub-netting, Host Configuration DHCP, ARP Protocol, ICMP protocol); Transport Layer (e.g. UDP Protocol, TCP Protocol, TCP Reliable Transfer and Sliding Window, TCP Flow and Congestion Control); Application Layer (e.g. DNS Protocol, NAT Protocol, HTTP Protocol, Persistent and Non-Persistent HTTP Connection) , the course includes complete a practical project or research by the students.

40354210 Special Topics in SE
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: Complete 60 CH)
Special topics of current trends in Software Engineering, the course includes complete a practical project or research by the students.

40354111 Software Design Patterns
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40353204 Software Specifications and Design)
A number of design patterns such as structural, creational, and behavioral design patterns. In addition, this course help to understand the principles behind software design patterns and when to apply a number of basic patterns. The course will help to understand how to build and use the components and how they can be used in software development using design patterns.

40352212 Introduction to Data Sciences
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40241202 Databases)
The essential elements of data science: data collection, management, curation, and cleaning; summarizing and visualizing data; basic ideas of statistical inference, and machine learning. This course covers topics including data collection, data preparation, data querying, data analytics including pattern mining, classification, clustering, data visualization, and parallel computing platforms. In addition, this course will cover advanced data analytics including NLP, knowledge extraction, graph analytics, graph querying, knowledge bases and crowd sourcing. The course introduces key application areas of data science including business intelligence, social media, biomedical informatics, computational ecology and e-discovery.

40353213 Business Analysis
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40342101 System Analysis and Design)
A solid foundation in business analysis, exploring the strategy, phases, components and process a BA uses to develop a project. From conducting an enterprise analysis to assessing the solution's implementation, student will learn the basics of how to manage the process and determine the appropriate parties to be involved. This course will discuss project requirements (the needs that must be fulfilled to complete the initiative), how to develop a communications plan, distributing work responsibilities, creating a business model and more. The course finishes with a discussion about tasks that the BA encounters when the solution is put into place.

40354114 Software Security
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40353204 Software Specifications and Design)
An overview of security issues for software, and provides programming methods for the development of secure applications. By the end of the course, students should be able to perform security risk management to assess the security risk of a system under development. Moreover, students will be able to perform all types of security testing. They will understand secure coding practices to prevent common vulnerabilities from being injected into software. Besides, students will be able to write security requirements (which include privacy requirements). They will be able to validate these requirements and to perform additional verification practices of static analysis and security inspection.

40354215 Software Engineering Ethics
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40352201 Fundamentals of Software Engineering)
Ethical problems that software engineers face, the codes of ethics of computing professional societies, legal issues involved in technology, and the social implications of computers, computing, and other digital technologies.

40354216 UI/UX Design
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 40322203 Visual Programming)
An introduction to the user interface and user experience design process and is oriented toward practical methods for approaching a design problem. The focus of the course is to develop conceptual designs based on the needs of users. Students will receive grounding in the following area of design including: user research methods, UI interface design, ui/ ux design sketching and design validation. This course aims to develop skills in the use and application of specific methods in user experience design.

50551105 Principles of Mathematics and Statistics
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: -)
Introduction to functions, limits and continuity, derivatives and rules, techniques of differentiation. It also introduces also the science of statistics and statistical research methods, sampling and sample data collection and classification. It covers various topics in descriptive statistics, correlation and regression analysis, time series, index numbers, the course includes complete a practical project or research by the students.

50223121 Numerical Analysis
(3 Credit Hours, Lecture: 3, Lab: 0, Prerequisite: 50551105 Principles of Mathematics and Statistics)
Introduction to the numerical analysis, and its primary objective is to develop the basic understanding of numerical algorithms and required skills to implement algorithms to solve mathematical problems, the course includes complete a practical project or research by the students.