AL Buraimi University College

كلية البريمي الجامعية

Department of Information Technology

Software Engineering Program

Revised May, 2019

Software Engineering Program

Vision

The Software Engineering Program aspires to be one of the distinctive degree program in the Sultanate of Oman. Its graduates will be highly sought by both industry and public sectors. This aims to prepare students for careers in software engineering, comprising construction and maintenance of packaged and customized software, software integration, and software project management.

Mission

Software Engineering is about the careful engineering of large and complex software systems to meet diverse and often critical needs. This Program addresses both analytical and practical skills required by the students to develop robust and efficient computer-based Software Systems for manufacturing, industrial, medical, government and business applications. Students will have individual and hands on experience with timely, cost-effective and state of art processes and tools.

Program Objectives

1. Our graduates demonstrate knowledge of engineering management practices and administrative functions.
2. Our graduates apply software engineering theory, principles, tools and processes, for the development and maintenance of complex, scalable software systems.
3. Our graduates analyze and specify software requirements through a productive working relationship with project stakeholders.
4. Our graduates design a system, component or process to meet desired needs incorporating the principles of professional ethics.
5. Our graduates apply techniques, skills and modern engineering tools necessary for using software engineering standard practices.
6. Our graduates show awareness of social and work ethics.
7. Our graduates show good command of language in general and specific contexts relating to the discipline.

Structure of the Software Engineering Study Plan

Bachelor Degree in Computer Science (4 years)

Number of credit hours required for obtaining a Bachelor degree in Software Engineering is 123 hours on intense study. The undergraduate program, leading to a B.S. in computer science, provides a broad knowledge of computing. It consists of core courses in programming languages, computer system organization and operating systems, data structures, computation theory, computer logic, and societal implications in computing.

Job Opportunities

The Software Engineering Program will provide the Program graduates with a vast number of job opportunities as a:

1. Computer software applications engineer
2. Computer software system engineer
3. Software solution developer
4. Software project manager
5. Software designer
6. Software analyst
7. Computer support specialist

Bachelor Degree (123 Credit Hours)

1. College General Requirements (Compulsory) 21 Credit Hours

SN	Course Number	Course Title	Credit Hours	Prerequisite
1	BCGE001	Arabic Language	3	–
2	BCGE002	Islamic culture	3	–
3	BCGE003	Omani Society	3	–
4	COMP100	Computers : Impact and use	3	–
5	ENGL002	General English	3	–
6	BCGE004	Study Skills	3	–
7	BCGE009	Entrepreneurship	3	–
8	IC3	IC3	0	–
Total			**21**	

2. Department Requirements (Compulsory) 27 Credit Hours

SN	Course Number	Course Title	Credit Hours	Prerequisite
1	COMP112	Algorithm and Programming (1)	3	–
2	COMP113	Algorithm and Programming (2)	3	COMP112
3	MATH152	Mathematics Analysis (1)	3	–
4	ENGL004	Technical Writing (1)	3	ENGL002
5	ENGL030	Technical Writing (2)	3	ENGL004
6	COMP123	Computer Architecture and Assembly Language	3	COMP112
7	COMP182	Data Structures And Program Design	3	COMP113
8	COMP241	Introduction to Database	3	IS431
9	BCIS490	Senior Project	3	Department Approval
Total			**27**	

3. Major Requirements (Compulsory) 66 Credit Hours

SN	Course Number	Course Title	Credit Hours	Prerequisite
1	COMP380	Introduction to Software Engineering	3	COMP112
2	BCGE006	Research Methodology	3	ENGL002
3	COMP282	Software Requirements Analysis and Specification	3	COMP380
4	COMP286	Software Engineering Management	3	COMP283
5	COMP242	Introduction to Web Development	3	COMP113
6	COMP389	Software Engineering Metrics	3	COMP283
7	COMP384	Software Architecture and Design	3	COMP286
8	COMP387	Software Verification and Validation	3	COMP389
9	COMP413	Object-Oriented Software Development	3	COMP182

10	COMP106	Visual Programming	3	COMP112
11	COMP206	Advanced Visual Programming	3	COMP106
12	SOM120	Basic Business Statistics	3	MATH152
13	IS441	Database Management Systems	3	COMP241
14	IS431	System Analysis and Design	3	COMP113
15	COMP484	Advanced Web Engineering	3	COMP242
16	COMP322	Introduction to Operating Systems and System Architecture	3	COMP123
17	COMP375	Mobile Application Development	3	COMP242
18	IS435	Data Communication and Networking	3	COMP123
19	COMP478	Advanced Software Engineering	3	COMP387
20	COMP377	Programming with Python	3	COMP113
21	COMP467	Multimedia Systems Design	3	COMP242
22	COMP424	Computer System Security	3	IS435
Total			**66**	

4. Major Requirements (Electives : Select 9 Credit Hours)

SN	Course Number	Course Title	Credit Hours	Prerequisites
1	COMP224	Web Development and User Interface Design	3	COMP242
2	COMP340	Programming with Java	3	COMP182
3	COMP324	XML Programming	3	COMP242
4	COMP485	Human Computer Interaction	3	COMP380
5	COMP411	Knowledge Management	3	IS431
6	COMP497	Selected Topics in Software Engineering	3	COMP384
7	COMP385	Graphical User Interfaces	3	COMP106
8	COMP479	Neural Networks	3	COMP113

9	COMP360	Information Retrieval and Web Agents	3	COMP242
10	IS457	Advanced Telecommunication and Networking	3	IS435
11	COMP381	Open Source Software Engineering	3	COMP282
12	COMP420	Advanced Operation System Concepts	3	COMP322
13	COMP282	Advanced Data Structure	3	COMP182
14	COMP350	E-Commerce	3	COMP242
15	COMP480	System Development Project	3	IS431
16	COMP232	Concepts of Programming Languages	3	COMP113
17	COMP270	Business Programming	3	COMP 241
18	PHIL230	Symbolic Logic	3	MATH152
19	COMP410	Data Mining	3	IS441
20	COMP412	Machine Learning	3	SOM120

Course Description: Software Engineering Program

COMP112 Algorithms and Programming (1) (3 Hrs. Prereq: -)

COMP112 is an introduction to the field of computer programming and algorithmic problem solving. The course will provide an understanding of its basic fundamentals and explains how to design an algorithm that solves a computational problem. The course will present techniques that can help students to discover an efficient solution using JAVA programming concepts and constructs. Students will have the opportunity to create, compile, and execute programs in a modern programming language. Design a computer program based on a given algorithm. Identify the various activities involved in translation a given problem into a corresponding executable program. Use windows environment to write and execute a program on a computer. Use the basic structures of JAVA programming language including data types; input/output statements, operators and expressions, control structures, strings, Predefined functions and arrays.

MATH152 Mathematical Analysis I (3 Hrs. Prereq: -)

Mathematical Analysis-1 course covers elementary concepts about sets, real numbers, relations and functions. This course includes the following topics: Basic set concepts, Universal set and empty set, Venn diagram, Set operations and their algebra, Classes of sets, power set, Real number system, Inequalities, Intervals, Relations and their types, Relation Composition, Partition, Graphs of the function and their types.

COMP100 Computers: Their Impact and Use (3 Hrs. Prereq: -)

COMP100 is an introductory course to the computer skills. Learn basic computer skills by using Microsoft office suite (including MS-Word, MS-PowerPoint, MS-Excel, MS-Publisher) and the use of Internet & World Wide Web. The focus on this course is on the basic knowledge required to be computer literate in today's society and digital world

ENGL002 General English (3 Hrs. Prereq: -)

The course is intended for students at beginner level to upper - intermediate level. It follows an integrated multi-skills approach in developing the student's performance in English. It lays special emphasis on the productive skills and uses authentic material relevant situations and language functions which are presented throughout the course.

BCGE004 Study Skills (3 Hrs. Prereq: -)

The course helps students to improve their English and gives them skill and practice in using English as a language of instruction; in this case they can improve their study habits in English. The course stresses the fact that once the skill has been introduced, it is the student's responsibility to continue practicing it on his/her own until it is mastered efficiently. Therefore, the course deals with topics such as using an English dictionary, learning vocabulary in English, outlining, improving your reading, using a library and preparing for examinations.

COMP113 Algorithms and Programming (2) (3 Hrs. Prereq: COMP 112)

An introduction to basic and advanced concepts of object-oriented programming: inheritance; interfaces; abstract classes; polymorphism; exception handling; GUI design; and applets.

COMP123 Computer Architecture and Assembly Language (3 Hrs. Prereq: COMP 112)

The course covers the following topics: Introduction to computer architecture, assembly language programming, system software and computer applications. Number systems and data representation. Internal organization of a computer. Boolean Algebra and Digital Logic. Primitive instructions and operations. Assembly language. (Integrated lecture/lab environment)

COMP 380 Introduction To Software Engineering (3 Hrs. - Prereq.: COMP 112))

Concepts and techniques for systems engineering, requirements analysis, design, implementation and testing of large scale computer systems. Principles of software engineering for production of reliable, maintainable and portable software products. Emphasis on object-oriented analysis and design techniques. Topics include unit, integration and systems testing, configuration management, software quality assurance practices, and an introduction to Computer Aided Software Engineering (CASE). This is a lecture portion of a course in software engineering involving the design and partial implementation of a software system as a group project.

ENGL004/c Technical writing (1) (3 Hrs. Prereq: - ENGL 002)

This is an ESP course aims at developing technical writing skills for students majoring in business areas and computer science. It focuses on promoting fluency in writing and providing language, writing models, that will be relevant to student's real needs in business affairs . Also, it enables students to practice appropriate vocabulary, grammatical structures, punctuation, spelling, style, and writing conventions. The purpose of this course is to help students utilize varied forms of technical writing to achieve success in the workplace as well as academic contexts. It covers the common types of writing that occur in the business and computer science worlds.

BCGE006 Research Methodology (3 Hrs. Prereq: - None)

This course provides knowledge about the concept, importance, benefits, and objectives of the research methods. The course provides knowledge about collection, classifying, summarizing, and analyzing of data as well as it provides the steps of conducting the basic academic research. Information related to research's report, research methodology, and exploring results are provided.

BCGE009 Entrepreneurship (3 Hrs. Prereq: - None)

The course aims at imparting basic knowledge about entrepreneurship and entrepreneurs. Topics covered include entrepreneurship process, business planning process, project financing and valuation, business models and strategies, phases of entrepreneurial growth. An overview of business practices in the world with special emphasis on GCC and Sultanate of Oman in particular is covered.

COMP106 Visual Programming (3 Hrs. Prereq: COMP 112)

Understand and implement visual aspects of doing programs in software development with the help of graphical user interface environment. This course provides students with the knowledge needed to develop applications in Microsoft Visual Basic.NET for the Microsoft .NET platform. The course focuses on user interfaces, program structure, language syntax, and implementation details.

COMP283 Software Requirements Analysis and Specification (3 Hrs. Prereq: COMP380)

An in-depth study of the early phases of the software development life cycle commonly called software requirements analysis and specification. Topics include the gathering of functional and nonfunctional

requirements, customer communication, requirements prototyping, requirements modeling, requirements validation, the documentation of requirements in terms of a formal software requirements specification, and the management of software requirements.

IS431 Systems Analysis and Design (3 Hrs.Prereq: - COMP113)

This course covers the systems development life cycle. Topics include standard tools and techniques to analyze and design an information system from a structured as well as an object-oriented perspective. A Computer-Aided Software Engineering (CASE) tool is used to facilitate the study.

BCGE001 Arabic Language (3 Hrs. Prereq: -)

1. دراسة _مدخل لمفهوم وسائل الإتصال وأنواعه
   دراسة__نصوص:_القرآن_الحديث_النثر_الشعر_مبادئ_البلاغة:_البيان_البديع__المعاني_وأنواعها_
2. الأسلوب_الإنشائي:_الأمر_النهي_التمني_النداء_الاستفهام_مبادئ_في_النحو_والصرف_والإملاء_المعربات_والمبنيات_المعرفة _والنكرة_المشتقات_قواعد_الهمزة_وعلامات_الترقيم_استخدام_المعاجم_اللغوية.

ENGL030 Technical Writing for IT (2) (3 Hrs. Prereq. ENGL004)

This is an ESP course aims at developing technical writing skills for students majoring in information technology (IT). It focuses on promoting writing fluency and providing language, writing models, which will be relevant to the real needs of the students. It prepares students to produce competent technical documents for both written and digital media with special emphases on problem-solving and decision-making reports. It provides students with principles of research and documentation, drafting and revision processes, technical proposals, and research papers and technical descriptions. It covers the aspects of collaborative and individual research works to analyze and write about various forms of data in information technology (IT).

COMP182 Data Structures and Program Design (3 Hrs. Prereq: COMP 113)

This course is designed to teach you how to program efficiently. It assumes that you know the basics of programming in Java, and you can write, debug and run simple programs in Java. The purpose of this course is to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This course is also about showing the correctness of algorithms and studying their computational complexities. This course offers the students a mixture of theoretical knowledge and practical experience.

COMP 241 Introduction to Database (3 Hrs. Prereq: IS431)

This course provides an introduction of databases to students. Other topics include database system architecture; logical organization of databases; entity relationship model; hierarchical, network, and relational data models; functional dependencies and normal forms. Design, implementation, and optimization of query languages.

IS435 Communication and Networking (3 Hrs. Prereq: COMP 123)

This course introduces the basic components of computer networks from software and hardware point of view. The role of physical components like network interface adapters, modems, cables, hubs and switches is explained. Basic network design using structured cabling and transmission of digital data as

electronic signals is presented. The layered structure of network protocols is discussed. It emphasis on protocol and interface specifications, in particular those adhering to OSI and TCP/IP reference models. The application layer protocols of TCP/IP such as HTTP, FTP, Telnet, and SMTP will be studied. Classification of networks on the basis of IP and structure of IP address is discussed. Sub netting is covered in this course and methods to find the errors and recover them in the data transmission are studied

COMP 206 Advance Visual Programming (3 Hrs. Prereq: COMP 106)

Design and implement advanced visual aspects of doing programs in software development with the help of graphical user interface environment. This course provides students with the knowledge needed to develop advanced applications in Microsoft Visual Basic.NET for the Microsoft .NET Platform. The course focuses on advanced features of user interfaces, program structure, language-syntax and implementation details. It also focuses on developing data-driven applications with reports and printing features.

COMP242 Introduction to Web Development (3 Hrs. Prereq: - COMP113)

Upon the successful completion of this course, a student will be able to Demonstrate basic HTML coding: create formatted text, write both absolute and relative links, write lists add visual elements and graphics, change color of text and background build tables, produce inline and embedded CSS (for formatting and page layout),insert multimedia elements, build tables, The purpose of this course is to provide students with an understanding of basic Web design and Web authoring skills in addition to the technical expertise required for creating and publishing of standards compliant HTML documents.

COMP389 Software Engineering Metrics (3 Hrs. Prereq: COMP283)

The role of metrics and quantitative models in software development. Product metrics, process metrics, measurement models and techniques for empirical validation. Measurement and analysis. Implementation of a metrics program. Measuring software size, complexity and functionality at different stages of software development. Use of measures to predict effort and schedule required for software projects. Measures of software quality. Analyzing defect data to predict software reliability. Performance measures. Management applications for metrics. Tools that support metrics collection, analysis, summary and presentation.

IS441 Database Management Systems (3 Hrs. Prereq: COMP241)

The design and implementation of computerized databases. Provides background for the selection and use of database management systems. Topics include types of available systems, data independence, integrity, privacy and query. The student will design and implement a database utilizing a commercial database management system.

COMP286 Software Engineering Management (3 Hrs. Prereq: COMP283)

Provides a framework for understanding software engineering management models, technologies, trends, tools and planning processes. Emphasizes the development of an individualized approach to managing software teams, projects and systems. The role of management as an increasingly critical factor in software engineering is examined.

Comp 484 Advanced Web Engineering (3 Hrs. Prereq: COMP 242)

This course is designed to introduce the student to the tools and facilities of Web design: page composition, PHP, web design and, code validation. Students will use these software technologies together to produce web design projects. Students will cover the Web design development process, with Macromedia Dreamweaver as the primary Web development tool. Topics covered include basic and enhanced site structure, local and remote site management, and optimization of Web graphics.

COMP413 Object-Oriented Software Development (3 Hrs. Prereq: COMP182)

Object-oriented design concepts, features and problems of complex systems, evolution of the object-oriented model, foundations and elements of the object-oriented model, classes and objects, relationships among classes, relationships among objects, interplay of classes and objects, approaches to identifying classes and objects, object-oriented design methodologies, methodology notation (elements of UML or any other selected notation, class and object diagrams, interaction diagrams, state transition diagrams, process and module diagrams, etc.), the object-oriented software development process (analysis, design and implementation), code reusability, management issues, applications and case studies, CASE tools

COMP384 Software Architecture and Design (3 Hrs. Prereq: COMP286)

Techniques, methods and tools for designing, building, analyzing and evaluating the structural, architectural and behavioral properties of software systems. It includes the study of the fundamental concepts and principles of software architectural design, structured design, object-oriented design, component level design and design for reuse.

COMP387 Software Verification and Validation (3 Hrs. Prereq: COMP389)

An in-depth study of verification and validation strategies and techniques as they apply to the development of quality software. Topics include test planning and management, testing tools, technical reviews, formal methods and the economics of software testing. The relationship of testing to other quality assurance activities as well as the integration of verification and validation into the overall software development process are also discussed.

COMP322 Introduction to Operating Systems and Systems Architecture (3 Hrs. Prereq: COMP123)

Examination of the principal types of systems including batch, multi-programming, and time-sharing. Networked systems are also discussed. The salient problems associated with implementing systems are considered including interrupt of event driven systems, multi-tasking, storage and data base management, and input-output. Emphasis will be placed on some of the simple algorithms used to solve common problems encountered such as deadlocks, queue service, and multiple access to data. Projects will be implemented to reinforce the lectures.

COMP 375 Mobile Application Development (3 Hrs. Prereq. COMP242)

As mobile devices are becoming more everywhere, developers are now devoting significant effort to build applications for these smartphone and tablet devices. This course examines the principles of mobile application design and development. It provides students with the knowledge needed to develop mobile applications using xml and java concepts using Android platform. Topics will include introduction to mobile computing, existing approaches and available technologies, mobile application development

architectures, user interface design and building, input methods, data handling, messaging, network techniques, location-based services, content providers and security issues in mobile applications.

COMP 490 Senior Project (3 Hrs. Prereq: Department Approval)

Concurrently students will work in teams of 2 to 4 members to construct a significant software application. Students will apply concepts, techniques, and CASE Tools introduced in previous courses. Team members will give a presentation of their contribution to the project.

COMP467 Multimedia Systems Design (3 Hrs. Prereq: COMP242)

Study of fundamentals of multimedia storage, processing, communication, presentation, and display with emphasis on audio, still images and video. Includes sampling theory, compression techniques and synchronization. Discussion of hypermedia and methodology issues. Multimedia programming; software tools for authoring multimedia applications and interfaces.

COMP478 Advanced Software Engineering (3 Hrs. Prereq: COMP387)

Examination of the critical and theoretical problems underlining the specification, design, development of evaluation of large software systems and the extent to which existing techniques and methodologies cope with these problems.

BCGE 003 Omani Society (3 Hrs. Prereq: -)

النتائج المرجوة من تدريس المقرر

ما الذي يجب أن يكون الطالب قد تعلمه أو أصبح قادرا على القيام به بعد دراسة هذا المقرر؟

يتعرف على البيئة العمانية ومكوناتها.
يتعرف على البعد الديموغرافي والخصائص السكانية للمجتمع العماني

يتعرف على التنظيم الإداري والسياسي

يتعرف على أبرز سمات البعد الاقتصادي قبل وبعد النهضة

يتعرف على خصائص المجتمع العماني من حيث: الأسرة- التعليم – الصحة- الثقافة.

SOM120 Basic Business Statistics (3 Hrs – Prereq: Math 152)

Basic elements of statistics for students in business and economics. Descriptive statistics, elements of probability, probability distributions (including normal), sampling distributions, statistical inference for means and proportions (including estimation and hypothesis testing), simple linear regression and correlation. Applications of these topics in business and economics are emphasized. The course requires assignments in which students are required to explain the results of statistical computations using personal computer software.

COMP424 Computer System Security (3 Hrs. Prereq: IS435)

The class is concerned with the fundamentals of computer security. Topics in this class can be divided into three main parts: cryptography (with a focus on single -key and public key), computer system security (database and operating systems issues including authentication, access control, malicious

software); as well as network security (including intrusion prevention/firewalls, intrusion detection, Denial of Service attacks, etc.).

COMP377 Programming with Python (3 Hrs. PreReq: COMP113)

Python programming is a good skill to have in data science, AI IOTs and Machine Learning. Introduction to Python Programming course is intended for students with little or no programming experience. It aims to provide students with an understanding of the role computation can play in solving problems and, regardless of their major, feel justifiably confident of their ability to write small programs that allow them to accomplish useful goals.

BCGE002 Islamic Culture (3 Hrs. Prereq: -)

1. يتضمن دراسة أهمية الثقافة الإسلامية ، وأهمية الدين في حياة الإنسان ، وأثر العقيدة الصحيحة في حياة الإنسان وسلوكه ، والعقيدة الإسلامية وأركان الإسلام ونظامه التشريعي ، والمرأة ومكانتها في الإسلام ، والغزو الفكري وأهدافه ووسائله وأخطاره ، حفظ سورة من القرآن الكريم مع تفسيرها .
2. المتطلبات الأولية المساق: لا توجد
3. عدد الساعات المعتمدة: 3 ساعات

Elective Courses:

COMP 224 Web Development and User Interface Design (3 Hrs. Prereq: COMP 242)

This course provides basics of internet; different types of technologies used in internet environment and demonstrate how it works. It also covers various technologies and tools used to design a web page, particularly by using HTML, JavaScript. It also teaches how we design dynamic web pages on server side by giving dynamic effects using scripting languages like Java Script and ASP. The student will design, develop and implement a web site using what he/she has learnt from the course practically.

COMP340 Programming with Java (3 Hrs. Prereq: COMP182)

An introduction to basic and advanced concepts of object oriented programming: inheritance; interfaces; abstract classes; polymorphism; exception handling; GUI design; and applets.

COMP324 XML Programming (3 Hrs. Prereq: COMP242)

This course introduces the basics of XML language and syntax, comparison between XML and HTML, Document type Definition (DTD), XML schema, Extensible stylesheet language (XSL) including XSL transformations (XSLT), XPath for navigating in XML documents, and XSL-FO for formatting XML documents.

COMP485 Human-Computer Interaction (3 Hrs. Prereq: COMP380)

The information exchange between humans and computer systems will be examined. Aspects of input/output devices, software engineering, and human factors will be discussed with respect to human-

computer interactions. Topics include: text and graphic display; user modelling; program design, debugging, complexity and comprehension; and current research studies and methodologies.

COMP411 Knowledge Management (3 Hrs. Prereq: IS431)

Provides an understanding of the knowledge and its applications in an organization. Growing interest in knowledge management and its practices. Principles of knowledge management, varieties of systems and related supporting technologies. Reuse of knowledge management and its impact on I.T infrastructure. Team-building and goal-setting exercises to create knowledge management projects.

COMP497 Selected Topics in Software Engineering (3 Hrs. Prereq. COMP384)

Innovative course of study. Topics to be specified in the Schedule of Classes. Different topics may be taken for credit.

COMP385- Graphical User Interfaces (3 Hrs. PreReq: COMP 106)

The design, development and analysis of programs requiring graphical, direct manipulation and user interfaces (GUIs) will be examined. The majority of modern software includes a GUI. The development tools, environments and style guides for common GUIs will be used in course assignments and discussed in lecture. The course involves the design and development of several GUI programs. The aesthetic and human computer interaction aspects and future trends in GUIs design and development also will be reviewed.

COMP 479 Neural Network (3 Hrs. – Prereq. COMP 113)

Overview of neural network history and types of problems: function approximation, classification, data clustering, time series, and dynamic systems, Feed forward Neural networks and radial Basis Function theory and background of neural networks nonlinear dynamic black-box modeling, classification and clustering with neural networks.

COMP360 Information Retrieval and Web Agents (3 Hrs. Prereq: COMP242)

Functional view of information retrieval, types of IRS, design issues of IRS (keyword based retrieval), file structures, thesaurus construction, etc.), IR data structures and algorithms (lexical analysis, stemming, term weighting, associative indexing, Boolean operations, string searching and matching techniques, etc.), relevance feedback and query modification, applications and case studies.

IS457 Advanced Telecommunication and networking (3 Hrs. PreReq: IS435)

An advanced course in telecommunications and networks emphasizing enterprise networking topics such as: network operating systems, network analysis and design, network security, virtual private networks, collaboration, wireless networks, VLAN, multi-platform integration, voice-over Internet protocol, web server strategies and storage area networks. This course will include hands-on projects involving network design and implementation.

COMP381 Open Source Software Engineering (3 Hrs. PreReq: COMP 282)

Introduction to open source software engineering concepts, principles and applications. Topics include history of open source software, open source software engineering models, open source products and software quality, strategies and business models, government policies toward open source software, work organization of open source software development, software and intellectual property rights,

organizations of the open source community, and case studies. Different open source software products for various applications are also discussed and used for group projects.

COMP381 Open Source Software Engineering (3 Hrs. Prereq: COMP282)

Introduction to open source software engineering concepts, principles and applications. Topics include history of open source software, open source software engineering models, open source products and software quality, strategies and business models, government policies toward open source software, work organization of open source software development, software and intellectual property rights, organizations of the open source community, and case studies. Different open source software products for various applications are also discussed and used for group projects.

COMP420 Advanced Operating Systems Concepts (3 Hrs. Prereq: - COMP322)

This course consists of advance level of knowledge related to operating systems. The course will introduce the classic synchronization, concurrency, Dining Philosophers, race conditions, acquiring and releasing lock, Use of Mutex, different types of memory management and re-locatable address generations, swapping and fragmentations, virtual allocation of memory logically and physically. Types of file systems, input and output device management and their controller and interrupt with driven I/O. Security, user authentication, security counter measures, protection domain, mechanism, attacks, and security approaches for mobile code.

COMP282 Advanced Data Structure (3 Hrs. Prereq: - COMP182)

Survey of the components of ADT; Implementing linked list and the Circular; Using of doubly linked list; Logical and physical representation of data; tree representation; data structure operations, matrix representations with stack and Queue.; searching techniques with Binary trees; Solve problems by using graph and explain the difference between a depth-first and a breadth-first search and to implement these searching strategies using stacks and queues, solve problems by using heap and heap sort methods.

COMP350 E-Commerce (3 Hrs. Prereq: COMP 242)

This course introduces principles of the Internet Economy; Business to business, business to consumers, and consumer to consumer; infrastructure of e-commerce; processes in building e-commerce website; outsource or hosting of e-commerce website; e-commerce payment systems; key dimensions of e-commerce security and encryption.

COMP480 Software System Development (3 Hrs. Prereq: IS431)

The design and implementation of computerized databases. Provides background for the selection and use of database management systems. Topics include types of available systems, functions of database administration, conceptual database design, data independence, integrity, privacy, and query. The student will design and implement a database utilizing a commercial database management system.

COMP232 Concepts of Programming Languages (3 Hrs. Prereq: - COMP113)

In this course we will cover issues in the design, implementation, and use of high-level programming languages. Historical background. How languages reflect different design philosophies and user requirements. Technical issues in the design of major imperative (procedural) programming languages. Other approaches to programming: functional programming, logic programming, and object-oriented programming.

COMP270 Business Programming (3 Hrs. Prereq: - COMP113)

This course uses the latest database tools and techniques for persistent data and object-modeling and management. Students gain extensive hands-on experience with exercises and a term project using Oracle, SQL Server, and other leading database management systems. Students learn the standards-based Structured Query Language (SQL) and the extensions to the SQL standards implemented in Oracle and SQL Server. Students learn the basics of database programming, and write simple stored procedures and triggers.

PHIL230 Symbolic logic (3 Hrs. Prereq: - MATH152)

In this course we will cover a natural deduction system of elementary symbolic logic. Introduction to modern deductive logic includes propositional logic and theory of quantification. We will also discuss philosophical aspects of symbolic logic whenever appropriate

COMP410 Data Mining (3 Hrs. Prereq: IS441)

A study of the concepts, principles, techniques and applications of data mining. Topics include data preprocessing, the ChiMerge algorithm, data warehousing, OLAP technology, the Apriori algorithm for mining frequent patterns, classification methods (such as decision tree induction, Bayesian classification, neural networks, support vector machines and genetic algorithms), clustering methods (such as k-means algorithm, hierarchical clustering methods and self-organizing feature map)and data mining applications (such as Web, finance, telecommunication, biology, medicine, science and engineering). Privacy protection and information security in data mining are also discussed.

COMP412 Machine Learning (3 Hrs. Prereq: SOM120)

A study of the concepts, principles, techniques, and applications of machine learning. Topics include concept-based learning, information-based learning (decision trees and ID3 algorithms), rule-based learning (association rules, learning ordered rules, learning unordered rules, and descriptive rule learning), distance-based learning (nearest neighbor algorithms), probability-based learning (Bayesian classifiers and networks), and error-based learning (perceptron, multivariable linear regression with gradient descent, nonlinear and multidimensional models, artificial neural networks, and support vector machines). Model ensembles learning and reinforcement learning are also discussed. Available for graduate credit. Graduate students will be required to complete advanced projects.

Revised: May 2019

Information Technology Department

Study Plan for Bachelor Degree in Software Engineering

S.E.

Year	Course Number	Course Title	Pre-Requisite	Units		Course Number	Course Title	Pre-Requisite	Units
	First Semester					**Second Semester**			
1	COMP112	Algorithms and Programming (1)		3		COMP113	Algorithms and Programming (2)	COMP112	3
	MATH152	Mathematics Analysis 1		3		COMP123	Computer Architecture and Assembly Language	COMP112	3
	COMP100	Computers: Their Impact and Use		3		COMP380	Introduction to Software Engineering	COMP112	3
	ENGL002	General English		3		ENGL004	Technical Writing (1)	ENGL002	3
	BCGE004	Study Skills		3		BCGE006	Research Methodology		3
						BCGE009	Entrepreneurship		3
		Total		15			**Total**		18
	Third Semester					**Fourth Semester**			
2	COMP106	Visual Programming	COMP112	3		COMP182	Data Structures and Program Design	COMP113	3
	COMP283	Software Requirements Analysis and Specification	COMP380	3		COMP241	Introduction to Database	IS431	3
	IS431	Systems Analysis and Design	COMP113	3		IS435	Communication and Networking	COMP123	3
	BCGE001	Arabic Language		3		COMP206	Advanced Visual Programming	COMP106	3
	ENGL030	Technical Writing (2)	ENGL004	3		COMP242	Introduction to Web Development	COMP113	3
		Total		15			**Total**		15
	Fifth Semester					**Sixth Semester**			
3	COMP389	Software Engineering Metrics	COMP283	3		COMP384	Software Architecture and Design	COMP286	3
	IS441	Database Management Systems	COMP241	3		COMP387	Software Verification and Validation	COMP389	3
	COMP286	Software Engineering Management	COMP283	3		COMP322	Introduction to Operating Systems and Systems Architecture	COMP123	3
	COMP484	Advanced Web Engineering	COMP242	3			Elective		3
	COMP413	Object-Oriented Software Development	COMP182	3		COMP375	Mobile Application Development	COMP242	3
		Total		15			**Total**		15
	Seventh Semester					**Eighth Semester**			
4	COMP490	Senior Project	*Dept. Appr.*	3		SOM120	Basic Business Statistics	MATH152	3
	COMP467	Multimedia Systems Design	COMP242	3		COMP424	Computer System Security	IS435	3
	COMP478	Advanced Software Engineering	COMP387	3		COMP377	Programming with Python	COMP113	3
		Elective		3			Elective		3
	BCGE003	Omani Society		3		BCGE002	Islamic Culture		3
		Total		15			**Total**		15
	Total Units								123

List of Elective Courses:

1	COMP224	Web Development and User Interface Design	COMP242	3	11	COMP381	Open Source Software Engineering	COMP282	3
2	COMP340	Programming with Java	COMP182	3	12	COMP420	Advanced Operating Systems Concepts	COMP322	3
3	COMP324	XML Programming	COMP242	3	13	COMP282	Advanced Data Structure	COMP182	3
4	COMP485	Human Computer Interaction	COMP380	3	14	COMP350	E-Commerce	COMP242	3
5	COMP411	Knowledge Management	IS431	3	15	COMP480	Software System Development	IS431	3
6	COMP497	Selected Topics in Software Engineering	COMP384	3	16	COMP232	Concepts of Programming Languages	COMP113	3
7	COMP385	Graphical User Interfaces	COMP106	3	17	COMP270	Business Programming	COMP241	3
8	COMP479	Neural Networks	COMP113	3	18	PHIL230	Symbolic Logic	MATH152	3
9	COMP360	Information Retrieval and Web Agents	COMP242	3	19	COMP410	Data Mining	IS441	3
10	IS457	Advanced Telecommunication and Networking	IS435	3	20	COMP412	Machine Learning	SOM120	3

Note: In addition, the student can also choose any I.T course as an elective from other study plan.