ASU

جامعة العلوم التطبيقية

APPLIED SCIENCE UNIVERSITY

Bachelor in Computer Science

Course Description

College Compulsory Courses

CSC 101- Mathematics 1

This is the first course in calculus for computer science students. The course is intended to develop skills of the students in functions, differential and integral calculus. As well as it is intended to illustrate various applications of calculus to technical various problems. The rules of differentiation will introduce, and methods of differentiating various algebraic and transcendental functions will be developed. Methods of algebraic integration will be introduced, with both definite and indefinite integrals being determined for a variety functions. Also, topics include: function, limits, and continuity will be covered by the course. (Prerequisite-None)

CSC 102- Discrete Mathematics

The course provides the student with a generalized knowledge of discrete structures fundamental to computer science, focusing on providing theoretical foundation of further work. Topics include: logic of compound statements, sets and binary operations, operations on sets, functions, relations, introduction to graph theory, diagraph and trees, sequence and series, simple proof techniques and mathematical induction. (Prerequisite- CSC101)

CSC 103- Probability and Statistics

This course introduces students to the detailed of Statistics and Probabilities. Topics include: introduction to concepts, tools, techniques and methods of probability and statistics. Presenting and describing of statistical data. Measures of central tendency and dispersion. Introduction to probabilities and their laws, sets, methods of counting. Random variables, probability distributions and sampling distributions. Correlation and Regression. (Prerequisite-None)

CSC 111- Structured Programming

This course will enable students to gain programming skills. It introduces computer programming methods and emphasis in problem solving on the fundamentals of structured design using the principles of top down problem solving strategy. The topics include: an introduction to computer programming, problem solving steps, program design modeling using pseudocode, algorithms, and flowcharts, also structured programming methods, constructs, and implementation using C++ programming language. (Prerequisite- None)

CSC 141- Communication Skills

The course covers issues related to effective technical communication, how to communicate with potential higher administrators, fellow, colleagues, and non-technical customers including: procedural (performing tasks), technical (using technology), personal (expressing identity), cooperative (interacting in groups), systems (interacting with organizations) and public (interacting with the wider community). **(Prerequisite: None)**

CSC 142- Computer Ethics and Social Responsibility

This course aims to provide students with a detailed knowledge and understanding of the principles and concepts which underpin a study of ethics and to give them in depth knowledge of how ethical concepts and actions impact on the field of information and

communication technologies (ICT). The course focuses on the fundamental concepts of ethics, ethics theories, ethical standards of ICT, professionals and users of ICT, and ethical issues related to privacy and digital crimes. (Prerequisite: ENG 111)

CSC 241- Scientific Research Methods

The course introduces students to advanced knowledge and understanding of the research and develops the concepts, organizational structure and deliverables of a research project using qualitative and quantitative methods including: problem statement definition, research scope, research objectives, methodologies, results and discussion. (Prerequisite: CSC 103)

Programme Compulsory Courses

CSC 202 – Digital Logic

This course provides students with detailed knowledge of design and implementation of digital circuits. Topics include: combinational and sequential logic circuits. Concepts of Boolean algebra, Karnaugh maps, flip-flops, registers, and counters along with various logic families and comparison of their behavior and characteristics. (Prerequisite: CSC 102)

CSC 203 – Mathematics 2

Mathematics II course provides computer science students with detailed knowledge ,basic and some advanced skills to deal with defined and some undefined problems in mathematics. The student will study algebraic and transcendental functions with an emphasis on integral calculus, sequences and series. The course will cover the main topics of definite and indefinite integrals, applications of integrals including areas, volumes and surface areas of solid revolution, arc length. Topics also include indeterminate form and L'Hopital's rule, techniques of integration, sequences, infinite series, power series and their convergence. (Prerequisite: CSC 101)

CSC 212 – Object Oriented Programming I

The aim of this course is to explain in detailed the principles of the object-oriented paradigm, provide familiarity with approaches to object-oriented modelling and design, syntax, pointers, files, class, inheritance, object-oriented programming concepts, and characteristics, data types, information hiding, constructors, destructors, friend function and friend class, array of objects, manipulating object, and inheritance (Prerequisite: CSC 111)

CSC 215 – Data Structures

This course covers advanced data Structures concepts, fundamentals and characteristics of Data structures, Array, Linked list, Stack, Queue, Graph, tree. In addition, student will learn and practice the suitable algorithm to manipulate the required data structure. (Prerequisite: CSC212)

CSC 221 – Database Systems

This course develops students' detailed knowledge and understanding in database systems. The students will be introduced to traditional files structure problems, database systems concepts, database systems evolution, database types, entity, attributes, relationship, and relationship degree, architecture, modeling methods using ERD, relational algebra, normalization and relational database constraints. SQL data definition and manipulation languages are also covered. (Prerequisite: CSC 212)

CSC 222 – Software Engineering I

This course provides students with detailed knowledge of the concepts and process models involved in software engineering. Students will learn principles of software engineering, evolving roles of software, software process, software product, process models and advanced models, requirements engineering: gathering, modeling and analysis, architectural design, component-level design, designing class-based components, component-level design for web applications, GUI, user interface design, web applications interface design. (Prerequisite: CSC 141)

CSC 231 – Computer Organization and Architecture

In this course students will be provided with detailed knowledge and understanding about fundamentals of computer organization, design and architecture as a hierarchy of levels, each one performing some well-defined function: the digital logic level, the microarchitecture level, the instruction set architecture level, and the assembly language level. The topics of the course include: introduction to the basic components of a computer, digital logic level, memory organization, the architecture of the microarchitecture level and its control, ISA level, assembly language and the assembly process and new trends in computer architecture. (Prerequisite: CSC 202)

CSC 301 – Numerical Analysis

This course provides students with advanced skills of numerical analysis. Topics include, mathematical preliminaries: computer arithmetic, round-off error, source of errors, solution of equations in one variable: bisection method, fixed point method, false position method, secant method, Newton-Raphson method, interpolation and polynomial approximation, introduction to interpolation, direct methods for solving linear systems of equations, iterative methods for solving linear systems, iterative methods for solving nonlinear systems, and curve fitting techniques. (Prerequisite: CSC 203)

CSC 302 – Computational Theory

This course emphasizes on advanced knowledge and understanding of computational and theoretical models. The topics include: concepts of automata, Finite Automata and Regular Expressions, Deterministic Finite Automata (DFA). Minimization of DFA; Non-Deterministic Finite Automata (NFA), Pumping Lemma, Mealy and Moore Machines, Ambiguity in Grammars and Languages. Standard Forms; Chomsky Normal Forms; Greibach Normal Forms, Pushdown Automata, Turing Machine. Computational Theory have direct bearing on practice, such as Automata on circuit design, verifying systems, compiler design, and search algorithms. (Prerequisite: CSC 215)

CSC 304 – Artificial Intelligence

This course provides students with advanced skills of Artificial intelligence (AI). Topics include: principles of intelligent systems, approaches used in AI field, problem solving strategies, knowledge representation and reasoning, uncertainty processing, learning and cooperation. (Prerequisite: CSC 212)

CSC 314 – Object Oriented Programming II

This course provides students with advanced skills of object-oriented programming (OOP). Topics include: programming techniques in designing and implementing an object-oriented program, implementing the characteristics and qualifiers of object-oriented programming to create programs for solving business problems with the application of some data structures using JAVA

programming language. Students will gain experience in the application of structured programming in practice and, mirroring professional practice, this will be facilitated largely in a real based environment. Students will learn and practice via teamwork. (Prerequisite: CSC 212)

CSC 321 – Systems Analysis and Design

This course provides students with an advanced knowledge and understanding of the concepts and practice of information systems analysis. The students will gain skills in Information Systems requirements analysis and logical system specifications. The student will also learn several systematic approaches and tools for the analysis process management and techniques that will enable them to analyze systems in a team environment. (Prerequisite: CSC 221)

CSC 322 – Web Based Software Development I

This course provides students with advanced knowledge and understanding of the principles of the context of Web based software development. Topics include: creating a web site using HTML, CSS and JavaScript. Other topics such as, creating tables, page division, inserting animation and multimedia, using/creating templates, managing hosting and its control panel are also covered. (Prerequisite: CSC 222)

CSC 323 – Visual Programming

This course provides students with critical knowledge and understanding of visual programming(C#, Visual C++,VB,...) theories and concepts. The course emphasises on event-driven programming methods, including creating and manipulating objects, classes, and using object-oriented tools. In addition to event -driven Windows programming, data types, operators, objects and properties, menus, procedures, control structures, database file processing, using human computer interaction principles to enhance user interface design. (Prerequisite: CSC 314 &CSC 221)

CSC 325 – Database Development

The course provides students with advanced knowledge and understanding of the database development topics: practicing the database PL/SQL (Cursors, Triggers, Functions, Procedures...). Also the student will practice Database development tools such as: APEX, Oracle Developer: Forms, Reports and Graphics. (Prerequisite: CSC 221)

CSC 331 – Operating Systems

This course presents and discusses advanced topics of operating systems including: virtual machines, real-time and embedded systems, distributed and parallel processing, file systems, fault tolerance, performance evaluation, management functions (memory, device (I/O), Process) and OS security/protection. (Prerequisite: CSC 231)

CSC 332 – Data Communications and Computer Networks

This course aims at providing students with a critical knowledge and a firm foundation of about data communication and computer networking. A thorough understanding of concepts and mechanisms underlying general telecommunications and networking is essential for students to be able to learn and grasp knowledge about other advanced and specific technologies and architectures. (Prerequisite: CSC 331)

CSC 401 – Algorithms Design and Analysis

Algorithms play the central role of both in science and practice of computing, It focusing on both the underlying mathematical theory and practice considerations of efficiency. This course introduces critical knowledge and understanding of concepts, theories, techniques to support the analysis and design of algorithms. Topics include analysis of algorithm efficiency, problem-solving: analysis and synthesis, analysis criteria, asymptotic growth rates, brute force and exhaustive search, time complexity, Sorting algorithms, graphs and Graph Traversals, Adjacency Matrix, Traversing Graphs, Breadth-first search and Depth-first search. (Prerequisite: CSC 215)

CSC 402 – Compilers Design

In this course, students will develop critical knowledge and understanding of specialist theories, principles and concepts of compilers design, major problems in translation of programming languages, compilation steps, difference among translators, Top-down versus bottom-up grammatical analysis, codes generation, and storage allocation strategies. It includes the building of translators, identifies and explores the main issues of the design of translators, lexical analysis, parsing, symbol tables, declaration, code generation, and optimization techniques. (Prerequisite: CSC 302)

CSC 425 – Graduation Project 1

In Graduation Project (1, 2), student critically applies the accurate IT project development methodologies to develop either a software system with accompanying report or a comprehensive IT research report based on the research activity undertaken - oriented to real life problems.

In this course (Graduation Project 1), the student identify specific problem (define the research questions), conducts a literature survey, analysis, and design for the proposed solution (an artifact) to the identified problem utilizing computer algorithms, software packages and/or hardware devices. This gives the opportunity for individual student, to take the responsibility of executing applied research in the CSC426-Graduation Project 2 with guidance from a supervisor. At the end of this course, the student will demonstrate the outcome of the project and will submit part one of graduation project report. (Prerequisite: CSC241+90 credit hours)

CSC 426 – Graduation Project 2

In this course, the student has to use the outcomes of CSC425 Graduation Project 1 to implement and test the proposed solution. This will take place with guidance from a supervisor. At the end of the course, the student has to demonstrate the project findings and submit a complete graduation project report. Student will use knowledge and skills gained in earlier studied courses and implement them in this phase. Students will be required to plan their work and meet deadlines, they also need to demonstrate the outcome of their IT research/ software system and write a comprehensive report. (Prerequisite: CSC 425)

CSC 435 – Ciphering and Computer Security

In this course, students will be provided with a critical knowledge and understanding of algorithms and protocols from modern cryptology, computer security and secure communication, and equip the student to apply this theory to the problems of building secure applications. The topics of the course include: computer security concepts, security attacks, security services, security mechanisms, symmetric and asymmetric ciphers, block ciphers, DES, AES, block cipher operation, message confidentiality, public-

key cryptography and message authentication, the RSA algorithm, Diffie-Hellman key exchange, key distribution, hash functions and user authentication. (Prerequisite: CSC 332)

CSC 436 – Mobile Computing

This course will provide students with both broad and in-depth knowledge, and a critical understanding of mobile computing and mobile communication from different viewpoints: infrastructures, principles and theories, technologies, and applications in different domains. In this course, the following topics will be discussed: basic issues in mobile computing, mobile communications, wireless networks, cellular network and architectures, communication protocols, mobile computing applications, smart phone technology, the application design and environment and the future of mobile computing. (Prerequisite: CSC 332)

CSC 441 – Internship

The internship is a pre-arranged, credit-bearing work experience, which allows a student to achieve personal goals that are aligned with the goals of a supervising professional organisation or agency. Internships provide opportunities to explore career options, test career choices, and encourage the development of skills within a chosen field. An internship allows students to relate theory with practical job experience as well as develop new skills that will be transferable to future employers. (Prerequisite: CSC321+90 credit hours)

Programme Electives Courses

CSC 204 – Linear Algebra

This course provides students with advanced skills of linear algebra to help them develop the ability to solve problems using linear algebra. This course includes: the study of systems of linear equations, matrices, determinants, vectors and vector spaces, linear transformations, eigenvalues and eigenvectors, and their applications. Linear algebra is a core course in many engineering, physics, mathematics, and computer science programs. Computer software will be used to enhance the learning and teaching of topics and techniques covered. (Prerequisite: CSC 203)

CSC 305 – Operations Research

Operations Research (OR) provides methodological tools which can support business managers in decisions making covering all aspects (internal and external). The purpose of the course is to provide students with advanced knowledge and some specialized tools to help them understand the operations research and mathematical modeling methods. These methods will help the students to solve problems in different environments that needs decisions. The course teach the students specialized methods of operations research and applications for optamisation problems.

The course cover topics that include: OR models, solving the OR model, linear programming applications, the simplex method and sensitivity analysis, duality and post-optimal analysis, Transportation model, and Network model. (Prerequisite: CSC 103)

CS326 – Mobile Application Development

The course provides students with critical knowledge and understanding of the mobile application development. This course covers key technologies underlying mobile application development. Topics include mobile platforms, GUI design, mobile programming, web services processing, database access and event-driven programming. (Prerequisite: CSC 322 & CSC 221)

CSC 327 – Web Based Software Development II

This course provides students with advanced knowledge and understanding of web applications development. Topics include: web applications development, smart devices and Web design programming languages (i.e. PHP, ASP.NET and others), web hosting, file transfer protocol, control panel for local and remote servers, web development tools (i.e. Word Press, Yii frameworks, Dreamweaver and others) (Prerequisite: CSC 322 & CSC 221)

CSC 328 – Human Computer Interaction

This course focuses on advanced topics in human computer interaction (HCI) development and use. The topics includes HCI analysis, design, implementation and evaluation of interactive computing system for human use; Ergonomics; Components of an interactive system; The Human; Input - output channels, the eye, hearing, touch, smell, taste, movement, memory; The computer: Interacting with computers, Virtual reality concept, Virtual reality for HW/SW, Virtual reality applications. (Prerequisite: CSC222)

CSC 329 – Multimedia Systems

This course provides students with advanced knowledge of multimedia systems. Topics include: multimedia system concepts, Color images and videos, Lossless Compression Algorithms, Lossy Compression Algorithms, Image Compression standards, Basics of digital Audio, Multimedia Network Applications, Internet multimedia content distribution, Multimedia over Wireless and Mobile Networks, Multimedia information sharing and retrieval. (Prerequisite: CSC 322)

CSC 421 – Software Engineering II

This course is a continuation of the study of software engineering I (CSC222). While Software Engineering I focuses on software production topics such as processes, requirements and architectures, Software Engineering II focuses on a advanced knowledge and understanding of a broad set of principles and practices affecting the success and failure of software development. The topics of the course include: Quality Concepts, Reviews, Quality Assurance, Software Testing (Component Level, Integration Level, Specialized Testing for Mobility), Project Management Concepts and Risk Management. The last part of the course will cover the principles of software maintenance, the different strategies for changing software systems and reengineering. (Prerequisite: CSC 222)

CSC 312 – Programming Languages Concepts

This course focuses on programming languages' specifications and concepts which gives students critical knowledge that they can argue persuasively why a particular language is appropriate or inappropriate for a particular problem. Topics are: Concepts of programming languages, domains, evaluation, environments, syntax formal methods, attribute grammars, binding, scope, types (data, user-defined, record, tuple, list, union, pointer, and reference), arithmetic expressions, operators, conversions, programming statements, subprograms, parameter-passing methods, design issues for functions, user-defined overloaded operators, dynamic scoping, abstract data types, and object-oriented languages. (Prerequisite: CSC 314)

CSC 315 – Data Mining

This course provides students with advanced knowledge and understanding of Data Mining algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. The Data Mining process includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of the generated structures. The course will cover all these issues and will illustrate the whole process by examples. (Prerequisite: CSC 304)

CSC 343– Special Topics in Computer Science

This course provides students with critical knowledge and understanding of the concepts and practice of the hottest topics and the latest research or technology in the field of Computer Science. The topic might be different from one run to another; an approval from the computer science department is required to select the course content whenever offering the course. (Prerequisite-None)

CSC 403 – Image Processing

This course provides students with critical knowledge of concepts and applications image processing. Topics include image processing concepts, intensity transformations and spatial filtering, some basic intensity transformation functions, histogram processing image enhancement, image filtering, image restoration, image deblurring and denoising, color image processing, color models, The RGB Color Model, The CMY and CMYK Color, image compression and watermarking and morphological image processing. (Prerequisite: CSC 401)

CSC 411 – Computer Graphics

This course provides students critical knowledge of Computer Graphics. Topics include: concepts of computer graphics. It starts with an overview of interactive computer graphics, Rectangles Using Paths to Draw Line, Transformations scale and translate, Methods: Drawing Ellipses, Rotate Method: Creating an two dimensional system and mapping, then it presents drawing algorithm, two-dimensional transformation; Clipping, filling and an introduction to 3-D graphics. (Prerequisite: CSC 401)

CSC 437 – Cloud Computing

The course provides students with critical knowledge and understanding of the cloud computing technologies. Topics include cloud infrastructure, reference model, resource management, programming models, application models, system characterizations, and implementations, deployment of cloud computing systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. (Prerequisite: CSC 332)

CSC 438 – Parallel and Distributed Computing

This course provides students critical knowledge and understanding in theory of parallelism and distributed computing, communication, concurrency, hardware and software features, language features for concurrent and distributed systems, concurrent and distributed algorithms and middleware, coordination, sequential and parallel processing, parallel and scalable architecture, parallel decomposition, multiple simultaneous computations, and parallel computer models. (Prerequisite: CSC 332)