Wasit University

جامعة واسط

First Cycle – Bachelor's Degree (B.Sc.) - Computer Science

بكالوريوس – علوم الحاسوب

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Computer Science to gain the Bachelor of Science degree. The program delivers (42) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج علوم الحاسوب للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (٤٢) مادة دراسية، على سبيل المثال، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
CS-101	Computer Organization	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
Main concepts of computer architecture; hardware components of a computer; instruction set: instruction formats, encoding of instructions, types; Execution unit: registers design, combinational shifters, ALU, division and multiplication algorithms; control unit: register transfer language, hardwired and microprogrammed control unit; memory unit: RAM, cache memory, associative memory, virtual memory; Input/output processors; introduction to multiprocessor systems and parallel processing			

Module 2

Code	Course/Module Title	ECTS	Semester
CS-102	Programming 1	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C++ programming language, in order to solve simple to moderate problems. The course covers the following: pre-processor directives, constants and variables, data types, input and output statements, control structures: sequential, selection and loop, built-in and user-defined functions, single and two-dimensional arrays, file operations, pointers, and structured data types			

Module 3

Code	Course/Module Title	ECTS	Semester
CS-103	Mathematics	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	0/0/1/1	105	45
Description			
Functions: domain, operations on functions, graphs of functions; trigonometric functions; limits: meaning of a limit, computational techniques, limits at infinity, infinite limits; continuity; limits and continuity of trigonometric functions; the derivative: techniques of differentiation, derivatives of trigonometric functions; the chain rule; implicit differentiation; differentials; Roll's Theorem; the mean value theorem; the extended mean value theorem; L'Hopital's rule; increasing and decreasing functions; concavity; maximum and minimum values of a function; graphs of functions including rational functions (asymptotes) and functions with vertical tangents (cusps); antiderivatives; the indefinite integral; the definite integral; the fundamental theorem of calculus ; the area under a curve; the area between two curves; transcendental functions: inverse functions, logarithmic and exponential functions; derivatives and integrals; limits (the indeterminate forms); hyperbolic functions and their inverses; inverse trigonometric functions.			

Module 4

Code	Course/Module Title	ECTS	Semester
CS-104	Computer Architecture	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course aims to provide a strong foundation for students to understand the modern eras of computer architecture (i.e., the single-core era, multi-core era, and accelerator era) and to apply these insights and principles to future computer designs. The course is structured around the three pri- mary building blocks of general-purpose computing systems: processors, memories, and networks.			

Module 5

Code	Course/Module Title	ECTS	Semester
UNI-101	Academic English Language 1	3	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	0/0/1/1	60	15
Description			
Students will focus on English at a pre-intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include such things as			

comparatives and superlatives, quantifiers, possessive adjectives and pronouns, vocabulary building, role- play activities for speaking, reading comprehension and writing short descriptive paragraphs.

Module 6

Code	Course/Module Title	ECTS	Semester
UNI-102	Human Rights & Democracy	3	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	0/0/1/1	60	15
Description			

Module 7

Code	Course/Module Title	ECTS	Semester
CS-121	Logic Design	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
Main concepts of Logic Design; Boolean Algebra; Basic Definitions; Basic Theorems and Properties; Boolean Functions; Canonical and Standard Forms; Digital Logic Gates; Minimization Methods; Combinational Logic; Sequential Logic. Numbering Systems; Binary Codes; Boolean Algebra; Gate-Level Minimization; Algebraic Simplifications; Karnaugh Maps; Don't-Care conditions; NAND and NOR Implementation; Combinational Logic; Adders and subtractors; Decoders and Encoders; Multiplexers and Demultiplexors; ROMS and PLAs; Sequential Logic; Flip Flops; Registers, Counters, and Serial adder.			

Module 8

Code	Course/Module Title	ECTS	Semester
CS-122	Programming 2	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
There is a variety of programming languages designed with different features aiming to address different types of problems. The unit is an advanced course for students who have already mastered one programming language. It is trying to consider the broad spectrum of different programming paradigms and how these can be used and translated.			

Module 9

Code	Course/Module Title	ECTS	Semester
CS-123	Numerical Analysis	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
The course is basic course in numerical methods. It introduces students to: Error analysis; Finding roots of a function: bracketing and iterative methods; Roots: direct and indirect solution of systems of linear equations; Solution of nonlinear systems; Approximation and interpolation; Numerical integration and differentiation; Programming language programs in parallel with material or using MATLAB . Weekly practice in the lab.			

Module 10

Code	Course/Module Title	ECTS	Semester
CS-124	Data Structure	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This Course introduces the students to the concepts of data structures. Topics includes: Pointers, and pointer operations. Array implementation of lists, stacks, and queues. Dynamic implementation of lists (singly, doubly, circular), stack operations and queue operations (and their implementation as linked lists). STL, like: vectors, pairs, maps, sets, lists, stacks, queue. Recursion. Tree dynamic, like binary search trees, segment, red-black, AVL trees. Hash Table and Collision resolution. Weekly lab assignments will be given to the students, in addition to problem solving tasks.			

Module 11

Code	Course/Module Title	ECTS	Semester
UNI-103	Arabic Language 1	3	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	0/0/1/1	60	15
Description			
This course aims to develop student's ability to read, comprehend, literary analyze, grammatically analyze, linguistically analyze, poetically analyze, and rhetorically analyze texts properly. The course also includes a selection of Arabic literature in poetry and prose representing different literary ages, in addition to several common forms of writing such as scientific article, news article, and others			

Module 12

Code	Course/Module Title	ECTS	Semester
UNI-104	Work Ethics	3	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	0/0/1/1	60	15
Description			

Module13

Code	Course/Module Title	ECTS	Semester
CS-201	Object Oriented Programming	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course presents the concept of object orientation and object-oriented programming (OOP) techniques using the C++ programming language. It equips the students with the theory and practice on problem solving techniques using the object-oriented approach. It emphasizes on the implementation of the OOP concepts including encapsulations, associations and inheritance. At the end of this course, students should be able to apply the OOP techniques to solve problems.			

Module14

Code	Course/Module Title	ECTS	Semester
CS-202	Algorithm	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
Definition of an algorithm; Algorithm design and techniques, such as sequential versus divide-and-conquer; Algorithm analysis; Concept of basic operations; Concept of worst, best, and average case analysis; Complexity analysis: big O, Omega and Theta notations; Recurrence equations and recursive algorithms; Searching and sorting algorithms; Concept of graphs; Graph algorithms.			

Module15

Code	Course/Module Title	ECTS	Semester
CS-203	System Software	6	3

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0/2/1/1	105	45
Description			
This course aims to introduce students to fundamental concepts of object-oriented programming with Java, gives an introduction to event driven programming and graphical user interface, exception handling, files manipulation and recursion. The topics covered in this course provide a foundation for more advanced courses in Computer Science and Information Systems.			

Module16

Code	Course/Module Title	ECTS	Semester
CS-204	Databases Fundamentals	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
DBMS Architecture, Storage Hierarchy, Indexes, Entity-relationship (E-R) modeling, The relational model, Relational Query Language (SQL), Query processing and optimization, Creation and manipulation of databases; Indices and views; Access rights management; Programming in SQL; Transaction Processing (Transactional properties, Concurrency control, Locking, and Crash recovery); Data dictionaries; Required software tools: A main-stream commercial DBMS such as MS SQL, Oracle.			

Module17

Code	Course/Module Title	ECTS	Semester
CS-205	Theory of Computation	3	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/0/1/1	60	15
Description			
Sets, Relations, Closure and Languages, Finite Automata, deterministic and nondeterministic, Closure and pumping lemma, Regular languages and expressions, Context-Free Grammar, Regular languages and Context-Free languages, pushdown automata, closure, determinism and parsing, LL (1) Grammar, Turing machines and machine schemas, examples, Introduction to P and NP classes.			

Module 18

Code	Course/Module Title	ECTS	Semester
UNI-105	Arabic Language 2	3	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

1	0/0/1/1	60	15
Description			
This course aims to improve the student's competence in the various linguistic skills in terms of reading, comprehension, and taste. This is achieved through the study of selected texts with many implications that raise issues in spelling, grammar, composition, meaning, and inference, and the use of an old and modern thesaurus			

Module19

Code	Course/Module Title	ECTS	Semester
CS- 221	Operating System	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course enables students to understand and implement operating systems functions in managing computer systems component. It includes the following major topics: Introduction to Hardware and Software Concepts; Process and CPU scheduling, Threads, Synchronous and Concurrent Execution, Deadlock and Indefinite Postponement; Memory management: Physical and Virtual Memory; Management of external storage and I/O devices: Files management; Performance and Optimization; Security and Protection; and Distributed Systems. Linux Assignments			

Module20

Code	Course/Module Title	ECTS	Semester
CS- 222	Computer Graphics	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course includes an overview of Computer Graphics applications; Graphics Output Primitives and its attributes; 2D and 3D Geometric Transformations; 2D Viewing and Clipping; Graphical User Interface and its attributes; Introduction to OpenGL programming and its applications; Example applications will be developed in lectures using C++ and OpenGL to demonstrate the techniques being presented. Application project of well-known 3D computer graphics software is required.			

Module21

Code	Course/Module Title	ECTS	Semester
CS- 223	Visual Programming	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

2	0/2/1/1	105	45
Description			
This course explores topics in Visual programming fundamentals; This course aims to introduce the students who have built a solid background in console systems to the concepts of Visual/GUI design using structured and OO programming skills acquired in previous courses. Topics include Windows Forms and Controls, Event-Driven Programming, Error Handling, Files, Multi-threading; Animation and graphics; Database connectivity. The practical part of this course will focus on training the students on various visual programming development kits, e.g., .NET framework. The course also includes a project, which brings together students coding, and user-interface design principles.			

Module22

Code	Course/Module Title	ECTS	Semester
CS- 224	Multimedia	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course covers the state-of-the-art technology for multimedia systems. This course introduces students to different media types (e.g., images, video, audio, graphics) and how they are used to create multimedia content and systems, algorithms and standards to compress and distribute them via networked systems to a variety of end clients. In general, the course includes issues related to a) content creation: media capture and representation, methods to assemble media types to create multimedia content; b) compression / Storage: students will study algorithms, protocols architectures related to compression; and c) distribution: Aspects of wired and wireless network distribution, Quality of Service, as well as digital rights management of distributed multimedia (watermarking & encryption). For each of the above ISO and ITU standards will also be addressed - JPEG, MPEG1, MPEG2, MPEG4, H.261, H.263, H.264, G.711, G.722, mp3, AAC, Dolby AC3, THX, surround sound, etc. We will also study applications and systems around multimedia – such as database applications with metadata (MPEG-7, MPEG-21). The course's goal will also be to explain modern distributed multimedia systems that take some or all of the above components to create practical applications, e.g., multimedia authoring, digital cinema, content management, multimedia databases, etc.			

Module23

Code	Course/Module Title	ECTS	Semester
CS- 225	Information Theory	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/0/1/1	60	15
Description			

Module24

Code	Course/Module Title	ECTS	Semester
UNI-106	Academic English Language 2	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/0/1/1	60	15
Description			
Students will focus on English at an intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include collocations, tense review, affirmative, negative statements, synonyms and antonyms, time clauses, conditionals, active and passive forms, reported speech, phrasal verbs, reading comprehension with detailed questions, vocabulary and writing developed descriptive and opinion essays.			

Module25

Code	Course/Module Title	ECTS	Semester
CS-301	Smart Systems	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			

Module25

Code	Course/Module Title	ECTS	Semester
CS-302	Compilers	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
Introduction to Compiling; Lexical analysis: specification and recognition of tokens, finite automata; Syntax analysis: grammars, top-down and bottom-up passing; Syntax-directed translation; Semantic routines; Storage-allocation strategies; Code generation; Error recovery.			

Module26

Code	Course/Module Title	ECTS	Semester
CS-303	System Analysis and Design	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

2	0/2/1/1	105	45
Description			
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 study			

Module27

Code	Course/Module Title	ECTS	Semester
CS-304	Computers Networks	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course explores key concepts and essential technologies of computer networks and broad range of topics in networking, including: General overview: Networks applications, Network classifications and topologies, Network layers, Channel performance measures, transmission media, Communication Network Protocols and architecture; Data link layer: framing, error detection and correction, CSMA/CD, LAN IEEE standards; Network layer: IP service model, IP Addressing, subnetting, Host configuration DHCP, ARP Protocol, ICMP protocol; Transport layer: UDP protocol, TCP protocol, TCP reliable transfer and sliding window, TCP flow and congestion control; Application layer: DNS protocol, NAT protocol, HTTP protocol, persistent and non-persistent HTTP connection.			

Module28

Code	Course/Module Title	ECTS	Semester
CS-305	Data Mining	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
The course introduces students to data mining, by studying their principles, algorithms, implementation methodology, and applications. It provides a comprehensive introduction to data mining, including data selection, cleaning, coding, using different pattern recognition techniques, and reporting; and introduce students to the applications of data mining by using commercial tools for creating business applications			

Module29

Code	Course/Module Title	ECTS	Semester
UNI-106	Academic English Language 3	3	5

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0/0/1/1	60	15
Description			
Students will focus on English at an upper-intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. Model verb review, silent letters and proper pronunciation, jobs and careers, requests and offers, more phrasal verbs with vocabulary building, relative clauses and relative pronouns, narrative tenses for writing exercises, wishes and regrets, reading and comprehending longer passages with direct and inference questions of medium difficulty, hypothesizing, and writing fully developed descriptive, argumentative and analytical essays of 350 words.			

Module30

Code	Course/Module Title	ECTS	Semester
CS-321	Website programming 1	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course is designed to introduce students the fundamental of knowledge, technologies and components for web application developments. The basic topics includes the standard HTML for content creation, CSS for content presentation, JavaScript for client-side logics, At the end of the course, the students should be able to apply the web base technologies and then implement it all in the creating functional data-centric online system project.			

Module31

Code	Course/Module Title	ECTS	Semester
CS-322	Encryption	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course introduces cryptography algorithms and mechanisms including: symmetric key algorithms such as AES and 3DES, public key algorithms such as RSA and ECC, digital signature, hash functions and MAC. The course provides security analysis to the algorithms as well			

Module32

Code	Course/Module Title	ECTS	Semester
CS-323	Artificial Intelligence	6	6

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0/2/1/1	105	45
Description			
Mathematical principles of AI; introducing several AI approaches and techniques and their underlying mathematical/algorithmic structure. Problems; problem spaces, and search. Heuristic search techniques, simulated annealing, genetic algorithms and Tabu search. Knowledge representation and logic; Constraint logic programming; Statistical reasoning; Fuzzy set theory and reasoning; Neural networks.			

Module33

Code	Course/Module Title	ECTS	Semester
CS-324	cloud computing	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This class will introduce the benefits of cloud computing as well as the challenges associated with it. The course will introduce different models of services that are common in cloud computing, namely: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). The course will discuss the types of clouds and benefits of each one as well as its cost model. The course includes studying current commercial offerings from major providers of cloud computing solutions like Amazon, Google, Microsoft, and others.			

Module34

Code	Course/Module Title	ECTS	Semester
CS-325	Distributed Database	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			

Module35

Code	Course/Module Title	ECTS	Semester
CS-401	Website programming 2	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45

Description
This course is designed to introduce students the fundamental of knowledge, technologies and components for web application developments. The basic topics includes the standard PHP for server-side logics and MySQL for database processing. At the end of the course, the students should be able to apply the web base technologies and then implement it all in the creating functional data-centric online system project.

Module36

Code	Course/Module Title	ECTS	Semester
CS-402	machine learning	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course focuses on statistical pattern recognition and machine learning techniques. The main topics of the course include: Bayesian decision theory, parametric density estimation (Maximum likelihood estimation (MLE) and non-parametric density estimation (Density Estimation, Parzen Window, K-Nearest Neighbor estimation, PNN, k-Nearest Neighbor classification rule), Bayesian parameter estimation, Hidden Markov models (HMM)), Linear Discriminant Analysis(Linear discriminant functions, generalized discriminant analysis, Support vector machines), probabilistic graphical models, Multilayer Neural Networks (Perceptron Model, Artificial Neural Networks ANN's, Feed-forward NN, Error Back-propagation Algorithm), deep learning, and feature reduction and selection. This course involves several programming assignments in which students will use Matlab and/or Python to build various machine learning and pattern classification models that can be used to solve real-world problems.			

Module37

Code	Course/Module Title	ECTS	Semester
CS-403	Computer & Network Security	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course explains Security protocols, authentication protocols, data integrity, digital signatures, intrusion detection, key management and distribution, viruses and other malicious codes, information flow, mobile code and agent security. Cryptographic algorithms: Secret Key Encryption (DES), Public Key Encryption (RSA), Message Digest Algorithm (MD5); Attacks and countermeasures: Packet sniffing, Spoofing and denial of service; Application layer security: HTTPS, secure email; Transport layer security: TLS, SSL; Network layer security: IP security (IPSec), AH protocol, ESP protocol; access control and Firewalls: Filter-based firewalls, Proxy-based firewalls; wireless networks security, security in IEEE 802.11, WEP protocol, EAP protocol			

Module38

Code	Course/Module Title	ECTS	Semester
CS-403	Internet of Things	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
Application areas of Internet of Things (IoT), Internet in Mobile Devices, Cloud and Sensor Networks, building blocks of Internet of Things and characteristics, design and program IoT-based devices and prototypes, Security of IoT devices, IoT with cloud computing, wireless technologies used in IoT systems, such as Wi-Fi, 6LoWPAN, Bluetooth and ZigBee			

Module39

Code	Course/Module Title	ECTS	Semester
CS-405	Graduate Project 1	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/0/1/1	105	45
Description			
Project includes theoretical and practical aspects in Computer Science; the first stage of the graduation project, includes project proposal, analysis and preparation, and project design stages. A report at the end of each stage should be delivered to the department and the supervisor.			

Module40

Code	Course/Module Title	ECTS	Semester
CS-421	Mobile APP	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course is concerned with the development of application for mobile and wireless handheld devices such as personal digital assistants (PDA) and mobile phones. These mobile applications are either native/installation-based, or web applications delivered over HTTP. In this course, the emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices. A current and dominant technology will be selected as a basis for teaching programming techniques and design patterns related to the development of these standalone applications and mobile portals to enterprise and m-commerce systems. Students will work at all stages of the software development life-cycle from inception through to implementation and testing. In doing so, students will be required to consider the impact of user characteristics, device capabilities, networking infrastructure and deployment environment, in order to develop software for the targeted			

mobile environment.

Module41

Code	Course/Module Title	ECTS	Semester
CS-422	Distributed Systems	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
Distributed system basic concepts: hardware, software, design issues; communication in distributed systems; layered protocols; synchronous vs. asynchronous communication mechanisms; client-server model vs. peer-to-peer model; Remote Method Invocation (RMI) and Remote Procedure Call (RPC); group communication; processes vs. threads; synchronization: physical vs. logical clocks, Lamport clocks, distributed mutual exclusion, election algorithms; distributed transactions; case studies.			

Module42

Code	Course/Module Title	ECTS	Semester
CS-423	Software Engineering	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
The product and the process, Software project management: Basic concepts, Software process and project metrics, Software project Planning, Risk management, Project scheduling and tracking, Quality assurance, Configuration management; Classical approaches: Waterfall and Spiral models; Object-oriented approach; Unified Modeling Language (UML); Concepts and notations of object- oriented analysis: Base concepts; Static concepts; Dynamic concepts; Object-oriented analysis: Analytical process; Analysis patterns; Static model; Dynamic model; Design notations and diagram; Design patterns.			

Module43

Code	Course/Module Title	ECTS	Semester
UNI-107	Academic English Language 4	3	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/0/1/1	60	15
Description			
Students will focus on English at an Advanced level. Students will analyze and produce 2 – 3 page essays with an emphasis on argumentation and persuasion working both independently and cooperatively to			

gather, evaluate, and synthesize necessary information. Class activities include interactive lectures, small group and class discussions, informal debates, peer feedback, individual presentations, focused listening exercises and focused viewing exercises as well as assorted reading, writing, and grammar assignments. There will be some poetry analysis together with reading and understanding a short story and a drama using basic literary terms and concepts.

Module44

Code	Course/Module Title	ECTS	Semester
CS-425	Image Processing	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0/2/1/1	105	45
Description			
This course presents the techniques of Digital Image Processing. Pre-Processing the image in spatial and frequency domains: Fourier and other transforms. Geometric transformations and Brightness interpolation. Continuous and discrete convolution and filtering. Gray level transforms. Color Image Processing. Edge Detection and Feature identification. Image Compression. Morphological Image Processing. Image Segmentation. Application to models of human and machine vision. Survey and Presentation about different topics and trends in			

Module45

Code	Course/Module Title	ECTS	Semester
CS-426	Graduate Project 2	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1/0/1/1	105	45
Description			
It includes the second stage of the graduation project, which covers the implementation, testing and evaluation stages, and completing the project in its final version. A documentation of the whole project should be delivered to the department and the supervisor. Finally, the project should be submitted for final examination.			

Contact

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