Diyala University
جامعة ديالى

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

بكالوريوس – علوم حاسبات

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 ( ) Modules with ( ) 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 الحاسبات للحصول على درجة بكالوريوس في العلوم ويقدم البرنامج ( ) مادة دراسية، على سبيل المثال، مع ( ) 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
COS-101	**Differentiation Methods**	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	67	58
Description			
Geometrical Meaning of a Derivative: In calculus, derivative is the instantaneous rate of change of a function with respect to one of its variables. The first principle of derivative well defined the derivative of a function. The first derivative of a function at a point defines the slope of the tangent to the graph at this point. Whereas the second derivative of a function at a point is a degree of deflection of the graph from the tangent at the point of contact. In this section, we explore the formulae or methods to find the derivatives of various types of functions.			

Module 2

Code	Course/Module Title	ECTS	Semester
COM-111	Introduction to Programming	8	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	4	112	88
Description			
Introduction to Programming is an introductory course that provides a solid foundation in computer programming. It covers essential concepts and techniques necessary for writing efficient and structured code. Students learn the basics of problem-solving, algorithm design, and programming logic. They gain proficiency in a programming language, such as Python or Java, and understand fundamental programming constructs like variables, data types, conditional statements, loops, and functions. The course emphasizes good coding practices, code readability, and debugging skills. Programming Fundamentals (I) equips students with the necessary skills to approach programming challenges, think critically, and lay the groundwork for more advanced programming concepts and languages.			

Module 3

Code	Course/Module Title	ECTS	Semester
COM-112	Computational mathematics	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	52	73
Description			
Computational mathematics is a foundational course in computer science and mathematics that focuses on the study of discrete mathematical structures and their applications. It explores topics such as sets, relations, functions, logic, proof techniques, and combinatorics. Students learn to analyze and solve problems using discrete structures, which are essential in computer science for designing algorithms, data structures, and network protocols. The course introduces concepts like graph theory, Boolean algebra, and formal logic, enabling students to understand the fundamental principles underlying computation. Discrete Structures (I) develops critical thinking, problem-solving, and abstract reasoning skills, providing a strong basis for further studies in computer science and related disciplines.			

Module 4

Code	Course/Module Title	ECTS	Semester
COM-113	Computer Skills (I)	4	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	66	34
Description			
Computer Skills (I) is a course designed to equip students with the essential skills necessary to navigate			

and utilize computer systems effectively. It covers a wide range of topics, including operating systems, file management, word processing, spreadsheets, and presentations. Students learn how to navigate through the user interface, customize settings, and efficiently use software applications commonly used in academic and professional settings. The course also introduces basic troubleshooting techniques and emphasizes good digital citizenship, including online safety and ethical use of technology. Computer Skills (I) provides students with a solid foundation in computer literacy, enabling them to confidently navigate the digital world and leverage technology for various tasks and projects.

Module 5

Code	Course/Module Title	ECTS	Semester
COM-114	Digital Logic	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	95	55
Description			
Digital Logic is a fundamental concept in computer science and electrical engineering that deals with the design and analysis of digital circuits and systems. It focuses on understanding and manipulating binary signals and logical operations to perform computations and control electronic devices. Digital Logic covers topics such as Boolean algebra, logic gates, combinational and sequential circuits, flip-flops, and registers. Students learn to design and optimize digital circuits, understand the principles of data representation and manipulation, and analyze the behavior of complex digital systems. Digital Logic is crucial in the design of computer processors, memory units, and other electronic components, providing the foundation for digital electronics and computer architecture			

Module 6

Code	Course/Module Title	ECTS	Semester
UD11	English Language	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		33	17
Description			
The English Language course is designed to enhance students' proficiency and fluency in the English language. It covers various aspects of English, including grammar, vocabulary, reading comprehension, writing, listening, and speaking skills. Through engaging activities, students develop a strong command of the language, enabling them to effectively communicate and express themselves in both academic and real-life situations. The course focuses on improving students' comprehension of written and spoken English, enhancing their writing skills, and fostering critical thinking and analytical abilities. Additionally, it may explore cultural aspects of the English-speaking world, helping students understand and appreciate different perspectives. The English Language course equips students with the tools and confidence to communicate fluently and successfully in English.			

Module 7

Code	Course/Module Title	ECTS	Semester
COS-102	Integration Methods	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	49	101
Description			
Integration Methods is an advanced mathematics course that builds upon the concepts learned in Differentiation Methods. It delves deeper into the study of calculus, focusing on integral calculus, sequences, and series. Students explore techniques of integration, including substitution, integration by parts, and trigonometric substitutions. They also learn about improper integrals and applications of integration, such as finding areas, volumes, and arc lengths. In addition, Integration Methods introduces the fundamental concepts of sequences and series, covering topics like convergence, divergence, and tests for series convergence. This course provides students with a deeper understanding of calculus and its applications, preparing them for more advanced mathematical and scientific studies.			

Module 8

Code	Course/Module Title	ECTS	Semester
COM-121	Programming Fundamentals	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	125	75
Description			
Programming Fundamentals is an intermediate-level course that builds upon the concepts learned in Introduction to Programming It focuses on further developing students' programming skills and introducing them to more advanced programming concepts and techniques. The course covers topics such as data structures, algorithms, object-oriented programming, and software development principles. Students learn to implement and manipulate various data structures, such as arrays, linked lists, stacks, queues, and trees, to efficiently store and process data. They also gain proficiency in algorithm design and analysis, enabling them to solve complex problems and optimize code performance. Additionally, Programming Fundamentals introduces object-oriented programming principles, including classes, inheritance, polymorphism, and encapsulation, fostering the development of modular and reusable code. The course equips students with the necessary skills to design and develop more sophisticated software applications.			

Module 9

Code	Course/Module Title	ECTS	Semester
COM-123	Computer Organization	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	107	43

Description
Computer Organization is a fundamental course that explores the internal structure and operation of computer systems. It focuses on understanding how hardware components and software interact to execute instructions and perform computations. The course covers topics such as digital logic circuits, machine language, instruction sets, memory systems, input/output systems, and processor architecture. Students learn how data is stored, retrieved, and processed within a computer system, including topics like CPU design, pipelining, and caching. Computer Organization provides insights into the underlying mechanisms that enable computers to function efficiently and optimally. It lays the foundation for understanding computer architecture and provides essential knowledge for computer engineers and software developers working at a low-level system.

Module 10

Code	Course/Module Title	ECTS	Semester
COM-122	Discrete Structures	5	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	65	85
Description			
Discrete Structures is an advanced course that builds upon the foundational concepts introduced in Discrete Structures. It dives deeper into the study of discrete mathematical structures and their applications in computer science and mathematics. The course covers topics such as advanced graph theory, combinatorics, formal languages, automata theory, and computational complexity. Students learn advanced techniques for analyzing and solving problems related to these structures, including advanced counting principles, advanced graph algorithms, and formal language parsing. Discrete Structures equips students with a deeper understanding of discrete mathematics and its applications in various fields, providing them with the necessary tools to tackle complex computational problems and analyze algorithms.			

Module 11

Code	Course/Module Title	ECTS	Semester
UD14	Human Rights and Democracy	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		33	17
Description			
The Human Rights and Democracy course explores the fundamental concepts, theories, and practices of human rights and democracy. It provides a comprehensive understanding of the principles and mechanisms that promote and protect human rights, as well as the significance of democracy in ensuring a just and inclusive society. The course covers topics such as the historical development of human rights, international human rights frameworks and institutions, the interplay between human rights and democracy, and contemporary challenges in the field. Students analyze case studies, engage in critical discussions, and examine real-world examples to gain a deeper appreciation of the importance			

of human rights and democracy in fostering social justice, equality, and dignity for all individuals.

Module 12

Code	Course/Module Title	ECTS	Semester
UD12	Arabic Language	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		33	17
Description			
The Arabic Language course introduces students to the rich and diverse world of the Arabic language and culture. It covers the fundamental aspects of Arabic, including grammar, vocabulary, reading, writing, listening, and speaking skills. Students learn to read and write in Arabic script, understand basic grammar rules, and develop conversational skills. The course also explores the cultural aspects of the Arab world, including traditions, customs, and literature. Through engaging activities, interactive exercises, and language practice, students gradually develop proficiency in Arabic, enabling them to communicate effectively in both formal and informal settings. The Arabic Language course provides a foundation for further exploration of the Arabic language and deepening cross-cultural understanding.			

Module 13

Code	Course/Module Title	ECTS	Semester
COM-211	**Introduction to Object Oriented Language**	7	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	4	99	76
Description			
Introduction to Object Oriented Language is an introductory course that focuses on the principles and concepts of object-oriented programming (OOP). It provides students with a solid foundation in designing and implementing software systems using the OOP paradigm. The course covers topics such as classes, objects, inheritance, polymorphism, encapsulation, and abstraction. Students learn to create modular and reusable code by designing and implementing classes, defining relationships between objects, and leveraging OOP concepts to solve programming problems. Through practical exercises and projects, students gain hands-on experience in designing and implementing object-oriented solutions. Introduction to Object Oriented Language equips students with essential skills for software development, promoting code reusability, maintainability, and scalability. It serves as a stepping stone to more advanced OOP concepts and frameworks in later courses.			

Module 14

Code	Course/Module Title	ECTS	Semester
COM-212	Data Structures	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

3	2	79	71
Description			
The Data Structures course explores the fundamental concepts and techniques for organizing and manipulating data efficiently. It focuses on the design, analysis, and implementation of various data structures, such as arrays, linked lists, stacks, queues, trees, and graphs. Students learn to evaluate the trade-offs between different data structures and choose the appropriate one for specific applications. The course also covers algorithms for searching, sorting, and manipulating data within these structures. Through hands-on programming assignments and projects, students develop practical skills in implementing and utilizing data structures. Data Structures provides the foundation for efficient data management and algorithm design, essential for solving complex computational problems in diverse fields such as software engineering, data analytics, and artificial intelligence.			

Module 15

Code	Course/Module Title	ECTS	Semester
COM-213	Computation Theory	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3		48	52
Description			
The Computation Theory course delves into the theoretical foundations of computation and explores the limits and capabilities of computational systems. It covers topics such as formal languages, automata theory, computability theory, and complexity theory. Students learn to analyze the properties of formal languages, study different types of automata, including finite automata and Turing machines, and understand the concept of computability and undecidability. The course also introduces the notion of computational complexity, examining the efficiency and resource requirements of algorithms. Through problem-solving exercises and theoretical discussions, students develop a deeper understanding of the fundamental principles underlying computation and gain insight into the boundaries of what can be computed. Computation Theory serves as a theoretical cornerstone for computer science and provides a basis for studying advanced topics in algorithms and theoretical computer science.			

Module 16

Code	Course/Module Title	ECTS	Semester
COM-214	Web Design and Programming	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	79	71
Description			
The Web Design and Programming course combines the principles of design and programming to provide students with the skills to create compelling and interactive websites. The course covers front-end web development technologies, including HTML, CSS, and JavaScript, as well as responsive design principles and user experience considerations. Students learn to design and implement visually			

appealing websites that are accessible across multiple devices and browsers. They also acquire proficiency in programming concepts and techniques for adding interactivity and dynamic functionality to web pages. Through hands-on projects and assignments, students develop practical skills in designing and building websites, gaining a comprehensive understanding of the entire web development process. The course prepares students for careers in web development and equips them with the necessary skills to create engaging and user-friendly web experiences.

Module 17

Code	Course/Module Title	ECTS	Semester
SCI-103	Numerical Methods	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3		48	52
Description			
Numerical Methods is a foundational course that focuses on the development and analysis of algorithms for solving mathematical problems using numerical approximations. The course covers topics such as root finding, interpolation, numerical integration, and solving systems of linear equations. Students learn various numerical techniques, including bisection, Newton-Raphson, Lagrange interpolation, and Gaussian elimination. They gain hands-on experience in implementing these methods using programming languages or specialized software. Numerical Methods equips students with the skills to tackle mathematical problems that cannot be solved analytically. It provides a foundation for further studies in scientific computing, optimization, and computational mathematics, enabling students to apply numerical techniques in various fields, including engineering, physics, and finance.			

Module 18

Code	Course/Module Title	ECTS	Semester
SCI-104	**Baath Party Crimes in Iraq**	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		33	17
Description			
ارتكب نظام البعث في العراق إبانّ حكمه عدد اً كبير ا مَّن الجرائم المختلفة، واختلافها يلْزم بيان مفاهيم وتعاريف للطالب ليكون على معرفة ودراية بما يمر به مما لها علاقة بمادة المنه ا ج ، كمفهوم الجريمة وأقسامها،والجرائم الدولية التي حُكِ م عليها قيادات وأزلام نظام البعث وف ق قانون المحكمة الجنائية العراقية العلى ا، وعليها سيكون هذا الف صل في مبحثين، المبحث الأول في بيان مفهوم الجرائم وأقسامها، والمبحث الآخر في بيان جرائم نظام البعث وفق قانون المحكمة الجنائية العراقية العلى ا لسنة ٢٠٠٥ م.			

Module 19

Code	Course/Module Title	ECTS	Semester
COM-221	Algorithms Design and Analysis	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	64	61
Description			
The Algorithms Design and Analysis course explores the fundamental principles and techniques used in designing efficient algorithms and analyzing their performance. Students learn to solve complex computational problems by developing algorithms and evaluating their efficiency. The course covers topics such as algorithm design paradigms, algorithmic analysis, data structures, graph algorithms, and dynamic programming. Students gain hands-on experience in implementing algorithms and measuring their computational complexity. They also learn to evaluate algorithmic trade-offs and make informed design choices. Algorithms Design and Analysis provide students with essential skills for solving challenging computational problems and optimizing algorithmic efficiency. The course serves as a cornerstone for advanced studies in algorithmic design, complexity theory, and computer science research.			

Module 20

Code	Course/Module Title	ECTS	Semester
COM-222	Computer Graphics	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	71
Description			
The Computer Graphics course introduces students to the principles and techniques used in creating and manipulating visual images using computer technology. It covers topics such as 2D and 3D graphics, rasterization, rendering, shading, and animation. Students learn to design and implement graphics algorithms to generate and manipulate images, including transformations, lighting effects, texture mapping, and perspective projection. Through hands-on projects, students gain practical experience in creating interactive graphics applications and understanding the underlying mathematical concepts. The course explores the applications of computer graphics in various fields, such as video games, virtual reality, simulation, and multimedia. Computer Graphics equips students with the skills to create visually stunning and immersive computer-generated imagery and prepares them for careers in graphics programming and visual effects.			

Module 21

Code	Course/Module Title	ECTS	Semester
COM-223	Computer Architecture	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
The Computer Architecture course provides an in-depth understanding of the organization, structure, and functioning of computer systems. It covers topics such as instruction set architecture, processor design, memory hierarchy, input/output systems, and parallel processing. Students learn to analyze and design computer systems by studying the interaction between hardware and software components. They explore topics such as pipelining, caching, virtual memory, and I/O interfacing. Through hands-on projects and simulations, students gain practical experience in designing and optimizing computer architectures. The course emphasizes performance evaluation, energy efficiency, and the impact of architectural choices on overall system performance. Computer Architecture equips students with the knowledge and skills to design, evaluate, and optimize computer systems for a wide range of applications.			

Module 22

Code	Course/Module Title	ECTS	Semester
COM-225	Object Oriented Programming	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	62
Description			
Object Oriented Programming is an introductory course that focuses on the principles and concepts of object-oriented programming (OOP). It provides students with a solid foundation in designing and implementing software systems using the OOP paradigm. The course covers topics such as classes, objects, inheritance, polymorphism, encapsulation, and abstraction. Students learn to create modular and reusable code by designing and implementing classes, defining relationships between objects, and leveraging OOP concepts to solve programming problems. Through practical exercises and projects, students gain hands-on experience in designing and implementing object-oriented solutions. Introduction to Object Oriented Language equips students with essential skills for software development, promoting code reusability, maintainability, and scalability. It serves as a stepping stone to more advanced OOP concepts and frameworks in later courses.			

Module 23

Code	Course/Module Title	ECTS	Semester
COM-224	Introduction to Python	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	71

Description
Python is a powerful, versatile cross-platform programming language that has a strong presence in diverse software engineering disciplines including web development, information security, network scripting, data science, and embedded systems. While Python itself may be a deceptively simple language, the vast array of frameworks and tools available for use across a variety of specialized fields make it a formidable tool in the arsenal of any technologist with areas of focus from Machine Learning to Cybersecurity. This course will provide a pragmatic and hands-on introduction to the Python programming language, with a focus on practical applications and projects, rather than theoretical topics. Students will design and build software to solve problems from various disciplines each week using Python. As the course progresses, students will learn to work with packages, data structures, object-oriented programming, and tools for data science and cybersecurity.

Module 24

Code	Course/Module Title	ECTS	Semester
COM-225	Visual Programming	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	37
Description			
This course introduces computer programming using the Visual Programming language with object-oriented programming principles. Emphasis is on event-driven programming methods, including creating and manipulating objects, classes, and using object-oriented tools such as the class debugger. Upon completion, students should be able to design, code, test and debug at a beginning level. This course has been approved to satisfy the Comprehensive Articulation Agreement for transferability as a pre-major and/or elective course requirement.			

Module 25

Code	Course/Module Title	ECTS	Semester
COM-311	Language Translator	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	64	36
Description			
This module presents the theory and practice of compilers. The first part of the module gives an overview of a compiler and its structure. A compiler for Mini Java is gradually developed in Java, using the parser generator ANTLR. As each new feature is added to the compiler, the relevant parts of the compiler are modified. The second part of the module covers some relevant topics from computation theory and algorithms in greater detail: finite state automata for lexical analysis; parsing algorithms for syntax analysis; This part also introduces several common optimizations.			

Module 26

Code	Course/Module Title	ECTS	Semester
COM-312	Artificial Intelligence	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	64	86
Description			
The course begins by describing what the latest generation of artificial intelligence techniques can do. After an introduction to some basic concepts and techniques, the course illustrates both the potential and current limitations of these techniques with examples from a variety of applications. We spend some time on understanding the strengths and weaknesses of human decision-making and learning, specifically in combination with AI systems. Exercises will include hands-on application of basic AI techniques as well as selection of appropriate technologies for a given problem and anticipation of design implications. In a final project, groups of students will participate in the creation of an AI-based application.			

Module 27

Code	Course/Module Title	ECTS	Semester
COM-313	Cryptography	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	72
Description			
This course provides the students with a deep understanding of how modern cryptographic schemes work. We introduce the necessary mathematical concepts in a way that is accessible for every student. This course focused on practical relevance by introducing most crypto algorithms that are used in modern real-world applications. For every crypto scheme, up-to-date security estimations and key length recommendations are given. We also discuss the important issue of software and hardware implementation for every algorithm. In addition to crypto algorithms, we introduce topics such as important cryptographic protocols, modes of operation, security services and key establishment techniques.			

Module 28

Code	Course/Module Title	ECTS	Semester

COM-314	Digital Image Processing	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	71
Description			
This section includes a description of the module, 100-150 words			

Module 29

Code	**Course/Module Title**	**ECTS**	**Semester**
COM-315	Introduction to Database	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	22
Description			
This subject serves as an introduction to data modelling and databases from a technical and data management perspective. The subject will include Entity Relationship modelling (from conceptual design to physical modelling), normalization, de-normalization, relational model and relational algebra, SQL, query processing and query optimization, transactions, storage organization, database administration, data warehousing and big data analytics. Other topics in data management and DBMS technology with an overview of modern MySQL systems may also be included.			

Module 30

Code	**Course/Module Title**	**ECTS**	**Semester**
COM-316	**Research Methodology**	4	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		33	67
Description			
This academic curriculum is a basic introduction to the scientific research methodology and what are the steps and methods to be followed by the researcher ·During the process of his search to solve the problem in question, with the available tools and programs that help solve the problem. The curriculum aims to: The objective required of the student in order to successfully pass the requirements of the course is the student's awareness of the importance of scientific research and scientific methods. used in carrying out research and auxiliary programs. .The student's awareness of the types of scientific research and each specialization has a method in scientific research			

Develop the student's ability in scientific research and teach him the basics of scientific research and the ethics of scientific research.

Module 31

Code	Course/Module Title	ECTS	Semester
COM-321	Software Engineering	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	49	51
Description			
This course introduces students to the different software development lifecycle (SDLC) phases used in developing, delivering, and maintaining software products. Students will also acquire basic software developmentskills and understand common terminology used in the software engineering profession. Students will also learn and practice using traditional coding standards/guidelines. Python software development libraries and debugging tools will be explored and used in projects to familiarize students			

Module 32

Code	Course/Module Title	ECTS	Semester
COM-322	Web applications Development	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	71
Description			

1. The aim of this module is to describe structures, procedures, protocols and principles of Web Development.
2. This course aims at designing web pages using HTML, CSS and Java Script.
3. To teach the fundamentals of HTML and the Web.
4. To teach the Internet and the World Wide Web.
5. Give a broad overview of Web Technologies.
6. Give practical exposure and theoretical understanding of the tools, technologies and techniques used to design and create a website.
7. Also learn about creating lists, getting feedback with forms, creating tables and frames.
8. The module also covers the basics of programming using HTML, CSS.
9. Finally, you will be introduced to JavaScript, dealing with Java Script variables and data types, Statement and Operators and Control structures, object based programming message box in JavaScript.

This course hoped that the knowledge would help you become proficient in HTML, fully versed in the language's syntax, semantics and elements of style.

Module 33

Code	Course/Module Title	ECTS	Semester
COM-323	Computer Security	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	71
Description			
General concepts and applied methods of computer security, especially as they relate to confidentiality, integrity, and availability of information assets. Topics include system security analysis, access control and various security models, identification and authentication, protection against external and internal threats, network protocols and Internet security. This course provides a broad introduction to a variety of topics in applied computer, network, and system security. These include system/software vulnerabilities, applied cryptography, host-based and network-based security, privacy, anonymity, usability, security economics, risks and vulnerabilities, policy formation, controls and protection methods, and issues of law and privacy			

Module 34

Code	Course/Module Title	ECTS	Semester
COM-324	Knowledge Representation	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2		33	67
Description			
Knowledge Representation (KR) is the study of how knowledge can be encoded in a machine, in such a way that the machine can use this knowledge to understand the world, solve problems, perform tasks or achieve goals. KR is one of the main areas in the field of Artificial Intelligence (AI), but it has deep roots in fields like philosophy, psychology, linguistics and mathematical logic. This course introduces the student to the main principles and methods of KR, with a special emphasis on its applicability to the area of robotics. The course comprises a mixture of top-down teaching on the basic principles, and bottom-up self-study on individual advanced issues			

Module 35

Code	Course/Module Title	ECTS	Semester
COM-325	Distributed Database	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47

Description
A contemporary look at field on Distributed Database Management Systems, focusing on techniques, trends and open problems that are currently shaping the research agenda for the next few years. Study of Distributed Database Architectures, Query Processing Algorithms, Distributed Transaction Models, Replication and Caching Algorithms, World-Wide Web and Databases, and Data Dissemination. The list of concrete topics includes: Internet Architecture, Client-Server Architectures, Peer-to-Peer Architectures, Wide-Area Information Systems, Heterogeneous Database Systems, Middleware Architectures, Mobile Databases, Data Dissemination and Broadcasting, Distributed Transactions, Replication, Caching, World Wide Web Architectures, Distributed View Materialization, Distributed Query Processing, Networks of Sensors, and Earth Science Information Systems.

Module 36

Code	Course/Module Title	ECTS	Semester
COM-326	Pattern Recognition	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47
Description			
Pattern recognition theory and practice is concerned with the design, analysis, and development of methods for the classification or description of patterns, objects, signals, and processes. At the heart of this discipline is our ability to infer the statistical behavior of data from limited data sets, and to assign data to classes based on generalized notions of distances in a probabilistic space. Many commercial applications of pattern recognition exist today, including voice recognition (e.g., Amazon Alexa), fingerprint classification (e.g., MacBook Pro touch bar), and retinal scanners (e.g., your favorite cheesy sci-fi movie).			

Module 37

Code	Course/Module Title	ECTS	Semester
COM-411	Introduction Operating Systems	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	64	61
Description			
Operating systems course is intended as a general introduced to the techniques used to implement operating systems and related kinds of systems software. The topics covered will be functions and structure of operating systems, process management (creation, synchronization, and communication); processor scheduling; deadlock prevention, avoidance, and recovery; main-memory management; virtual memory management (swapping, paging, segmentation and page-replacement algorithms);			

control of disks and other input/output devices; file-system structure and implementation; and protection and security

Module 38

Code	Course/Module Title	ECTS	Semester
COM-412	Machine Learning	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	46
Description			

This is core course of Computer Science Department and that presents basic tools for the design of machine learning algorithms. It serves as a building block in many disciplines that utilize Artificial intelligence techniques and optimization methods. The goal of this course is to;

1. Teaching the student machine learning methods that depend on conclusion and future prediction of events through.
2. Teaching the student statistical methods, artificial networks and their practical applications.

Teaching the student how to develop scientific algorithms and research methods.

Module 39

Code	Course/Module Title	ECTS	Semester
COM-413	Computer Networks	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	94	56
Description			

This module introduces the students to Computer Networks through an analysis of basic networking fundamentals. The aim of this module is to provide you with a basic understanding of computer networking. By the end of this module the student should be able to:

1. Demonstrate knowledge of the principles of operation of networking models.
2. Demonstrate knowledge of the principles of operation of networking components and protocols.

Module 40

Code	Course/Module Title	ECTS	Semester
COM-414	Multimedia	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	49	76
Description			
The major goals of this course are: 1. Learn how learning theories influence the development of multimedia product 2. Explore a brief history of multimedia in education; 3. Develop competencies in designing and creating interactive multimedia applications by explaining how elements of these applications reflect a theory of how learning will occur; 4. Work with all aspects of text, audio, images and video; 5. Learn the phases involved in multimedia planning, design and production; 7. Be able to use various multimedia authoring tools 8. Be able to design and create interactive multimedia products 9. Develop competencies in designing and producing instructional multimedia 10. Apply contemporary theories of multimedia learning to the development of multimedia products. 11. Evaluate existing multimedia products that can be used to design instructional and informational material.			

Module 41

Code	Course/Module Title	ECTS	Semester
COM-415	Coding and Data Compression	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47
Description			
The course provides an overview of classical and modern techniques and algorithms of various types data compression. It coversstatistical and dictionary methods, lossless and lossy compression algorithms in graphics, video and audio compression. Introduction to Information .eory: Entropy, Information Value, Data Redundancy. 2. Statistical Methods: Shannon-Fano Algorithm, Hu.man Algorithm, Adaptive Hu.man Coding. 3. Statistical Methods: Arithmetic Coding (Encoding, Decoding, Adaptive Coding). 4. Dictionary Methods: LZ77, LZ78, LZW Algorithms. 5. Image Compression: Discrete Cosine Transform, JPEG. 6. Wavelet Methods: Discrete Wavelet Transform, JPEG 2000. 7. Video Compression: Motion Compensation, Temporal and Spatial Prediction. MPEG and H.264. 8. Audio Compression: Digital Audio, WAVE, FLAC, MPEG-1/2 Audio Layers.			

Module 42

Code	Course/Module Title	ECTS	Semester
SCI-106	Research Project (I)	4	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
	2	32	68
Description			
The mission of this program is to inform, challenge, and train our diverse student body for a constantly changing world of technology. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline Communicate effectively in a variety of professional contexts			

Module 43

Code	Course/Module Title	ECTS	Semester
COM-421	Techniques of Operating Systems	7	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	96
Description			
This course includes the concepts of operating system components. It consists of process management, deadlocks and process synchronization, memory management techniques, File system implementation, and I/O device management principles. It also includes case study on Linux operating system. Describe need and role of operating system. Analyze and criticize techniques used in OS components. Demonstrate and simulate algorithms used in OS components. Identify algorithms and techniques used in different components of Linux			

Module 44

Code	Course/Module Title	ECTS	Semester

COM-422	Data Mining	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	21
Description			
Data Mining studies 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. It is currently regarded as the key element of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery 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. Special emphasis will be give to the Machine Learning methods as they provide the real knowledge discovery tools. Important related technologies, as data warehousing and on-line analytical processing (OLAP) will be also discussed..			

Module 45

Code	Course/Module Title	ECTS	Semester
COM-423	Network Security	7	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	79	96
Description			
The course will begin with an introduction to networking. Students will get hands on experience with enterprise level networking equipment (switches, routers, firewalls). It will be followed by an introduction to network level attacks and various defense mechanisms. Students will learn to mount attacks and defend against them using a variety of software tools. The class will then focus on wireless networking security. Students will learn how to configure, attack, and defend wireless networks. After that the class will concentrate on host level security. Students will learn to attack and defend common network services such as DNS, HTTP, SQL, and FTP.			

Module 46

Code	Course/Module Title	ECTS	Semester
COM-424	Modeling and Simulation	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	48	52
Description			
This course provides an introduction to the process of designing models of existing or proposed real-			

world systems, and how to use the models to perform simulations that allow for predictions about the future behavior of the system. The system could be something as mundane as a cricket match, to something more complex, such as a communication network, or transportation system. Most systems of interest will require the development of one or more statistical models. Thus, modeling and simulation has a significant overlap with probability and statistics. The course topics will include a review of concepts from probability and statistics that are relevant to modeling and simulation, algorithms for random-variable sampling, modeling and analysis of basic queueing systems, variance-reduction techniques, statistical-validation techniques, Independent Monte Carlo (IMC) and Markov-Chain Monte Carlo (MCMC) simulations, and discrete-event modeling and simulation. Programming assignments will be provided throughout the semester.

Module 47

Code	Course/Module Title	ECTS	Semester
COM-425	Evolutionary Computing	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	37
Description			

This is core course of Computer Science Department and that presents basic tools for the design of Evolutionary Computing techniques. It serves as a building block in many disciplines that utilize Artificial intelligence techniques and Genetic Algorithm. The goal of this course is to;

1. Teaching the student Evolutionary methods that depend on optimization.
2. Teaching the student data representation methods, selection techniques, crossover and mutation methods.

Module 48

Code	Course/Module Title	ECTS	Semester
SCI-107	Research Project (II)	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
	3	48	52
Description			

The mission of this program is to inform, challenge, and train our diverse student body for a constantly changing world of technology.

- Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions
- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline

- Communicate effectively in a variety of professional contexts
- Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles
- Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline
- Apply computer science theory and software development fundamentals to produce

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