# University of Baghdad

# جامعة بغداد

*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 (48) 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 (48) مادة دراسية مع (6000) إجمالي ساعات حمل الطالب و240 إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

## 2. Undergraduate Courses 2023-2024

**Module 1**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC11001 | Programming Fundamentals I | 8 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 121 |
| **Description** | | | |
| This module is mainly divided into three parts to learn the three problem solving techniques. In Sequential path the student will learn how to define a program as a sequence of statements whose objective is to accomplish some task. Next, in Selective path, the student will learn how to tell a computer that it does not have to follow a simple sequential order of statements; it can also make decisions, where the program executes particular statements depending on some condition(s). Finally, in the third technique, the student will learn how a computer repeats certain statements over and over until certain conditions are met. The student must learn where is the decision maker, the body of the loop, and the statement that eventually sets the expression to false. The student must also learn a counter controlled while loop that uses a counter to control the loop and a sentinel-controlled while loop that uses a sentinel to control the while loop. | | | |

**Module 2**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC11002 | Computer Organization | 7 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 96 |
| **Description** | | | |
| Computer Organization focuses on understanding the internal structure and functioning of a computer system. It encompasses the physical components, organization, and interaction of hardware and software components within a computer.<br>At its core, computer organization investigates the architecture and design of a computer system, including the central processing unit (CPU), memory systems, input/output devices, and the interconnections between these components. It explores how data and instructions flow through the system and how computations are performed.<br>The course covers topics such as instruction execution, instruction cycle, fetch-decode-execute cycle, and the role of the CPU in processing data and its responsibility in executing instructions and performing calculations | | | |

**Module 3**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC11003 | Introduction to Computer Science | 5 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | **Lect** | 48 | 77 |
| **Description** | | | |
| An introduction to computer science will be achieved through overviewing the computer system and identifying its components together with introducing the needed interaction between these components for performing solution for given tasks regardless of the programming languages used. The student will recognize the different generations to programming languages. This course aims to prepare a program designer. The fundamental stages of the program development life cycle have to be studied. Focus in this course will be on ways to design the solution of a given problem either by writing an algorithm or by drawing a flowchart. Also, program control flow has to be recognized. Moreover, the stages for compiling and processing a given program have to be identified. Furthermore, the common methodologies for programming will be studied. | | | |

**Module 4**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC11004 | Calculus | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | **Lect** | 48 | 102 |
| **Description** | | | |
| Students are expected to use their mathematical knowledge and practices to solve problems. This course strengthens students' understanding of functions in preparation for the process of differentiation and integration. Calculus concepts explored include limits and continuity, derivatives, definite integrals, exponential and logarithmic functions, trigonometric functions, and techniques of integration. Emphasis is placed on the exploration of real-world calculus applications. Students are expected to learn to choose and use appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Students are expected to complete 4 open responses and 4 core assignments. Curriculum for this course requires 2-3 hours a week of independent practice such as homework, reading and projects. Graphing calculators are required. | | | |

**Module 5**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOB102 | English Language I | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 17 |
| **Description** | | | |
| New Headway Beginner Plus is a Beginner course in English intended to provide students with the fundamentals of the language and a foundation at First Year students / college of science, moving towards a higher level of proficiency at this stage. At the end of the course the student understand basic everyday expressions and short, simple texts, engage in simple oral and written communication in order to provide and obtain information, construct very basic and simple sentences, and demonstrate limited control of essential grammatical structures. | | | |

**Module 6**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOB104 | Democracy and Human Rights | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 17 |
| **Description** | | | |
| This course deals with the basic concept of human rights and democracy , clarifying and training students on the most important principles of human rights and democracy, organizing discussions and presentations on the most vital and basic topics affecting community building, related to human rights and democracy, adopting teamwork with students to develop their cognitive abilities and create a spirit of cooperation, initiative, creativity and exchange of views in an effort to build the foundations of peaceful community coexistence, providing society with conscious youth aware of the importance of its role in building society, its unity and cohesion through spreading the culture of human rights and establishing the rules of correct democracy, Human rights guarantee the protection and respect of an individual's interests, even when he or she is not a majority. In a democratic climate, sustainable democratic power cannot be conceived without respecting, protecting and fulfilling human rights. | | | |

**Module 7**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC12105 | Programming Fundamentals II | 8 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+4 | **Lect+Lab** | 109 | 91 |
| **Description** | | | |
| This module is mainly divided into two parts to learn. In the first part, the student will learn how to define structured data types, where each data item is a collection of other data items. Simple data types are building blocks of structured data types. The first structured data type that we will discuss is an array. One-dimensional and two-dimensional arrays are examined in this part. In the second part of this module, the student will learn how to tell a computer that it does not have to follow a simple structure of one function (main), it can also make user-defined functions. The student learned in the previous module (module 1) that a C++ program is a collection of functions. One such function is main. The programs in the previous module (module 1) use only the function main; the programming instructions are packed into one function. For large programs, it is not practical (although it is possible) to put the entire programming instructions into one function, as you will discover in this part. The student must learn to break the problem into manageable pieces. This part first discusses the user-defined functions. | | | |

**Module 8**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC12006 | Discrete Structures | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | **Lect** | 48 | 102 |
| **Description** | | | |
| Discrete math can be used for software design specifications, analysis of algorithms, and other practical applications, but it's really a great tool to develop as a programmer. Put simply, it's a building block for logical thinking , so Discrete Structures is the study of objects that have discrete as opposed to continuous values including the foundations of logic, algorithms and their complexity, mathematical reasoning, relations, graphs, trees and combinatorics<br>Discrete Structures Mathematics<br>Topics include: number bases, mathematical induction, sets, relations, functions, congruence, recursion, combinations and permutations, probability, graphs, trees, logic, Boolean algebra, and proof techniques. | | | |

**Module 9**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC12007 | Digital Logic | 7 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 96 |
| **Description** | | | |
| The course will teach the students about different systems in digital computers including: binary, octal, hexadecimal number systems, gray code and ASCII code. The course will help the students to simplify and analyze basic combinational logic circuits and write the Boolean output expression for any combinational logic circuit. In addition the students will learn to design logic circuits to do specific functions like addition in binary as well as studying the fundamentals of sequential logic devices such as Flip-Flop. | | | |

**Module 10**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC12008 | Academic Writing Skills | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 61 |
| **Description** | | | |
| The objectives of academic writing skills encompass the development of critical thinking, communication, and research skills, ultimately aiming to contribute to the creation, analysis, and dissemination of knowledge within and beyond academia. | | | |

**Module 11**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC12009 | Probability and Statistics | 2 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 17 |
| **Description** | | | |
| The introductory statistics course may be selected by students to fulfill a general education requirement. The students gains experience in the statistical field in terms of data collection such as (qualitative data and quantitative data), which support them in building databases and managing their projects, as well as selecting the sample size from population size in the study.<br>On the other hand, students can use computer models to build these statistical models based on statistical concepts and evaluate variables via improve the ability of students. Hence, it can be use of software and scientific methods according into knowledge of statistical tools. | | | |

**Module 12**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOB101 | Arabic Language I | 2 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 17 |
| **Description** | | | |
| -تعلم مهارات الكتابة والاملاء والتعبير الصحيح خلال تطبيق قواعد اللغة العربية بشكل مفصل وتطبيقي على نصوص عربية.<br>2- لفهم الجمع وأنواع الاسماء وكيفية التعامل معها.<br>3- لفهم العدد واستعماله بشكل صحيح من حيث المطابقة والمخالفة<br>للتفريق بين الضاد والظاء.<br>4- للتفريق ومعرفة استعمال التاء المربوطة والتاء الطويلة.<br>5-التمييز بين العلامات الاصلية والفرعية.<br>6- تعلم استعمال الأدوات وعمل كل أداة ومعناها في التعبير. | | | |

**Module 13**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC23110 | Data Structures | 6 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| This course will focus on the fundamental data structures in computer science, how to implement these data structures in code using C++, and understand their properties and use cases. The course generally starts with an introduction to basic data structures such as arrays, linked lists, stacks, and queues. Array properties, allocation methods, and applications are covered. The fundamental principles of stack and queue data structures and their applications, operations, and algorithms are addressed. The basics of the linked list data structure, its memory allocation, types, operations, advantages, and disadvantages are also introduced. Then, non-linear data structures such as trees, graphs, and networks are introduced. Tree definitions, terminology, properties, and types are covered. Binary trees, types, traversal, and representation techniques, applications, and fundamental operations are all covered. After that, the graph data structure along with its types, representation, and traversal algorithms are presented. | | | |

**Module 14**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC23111 | Object Oriented Programming | 6 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 71 |
| **Description** | | | |
| The object-oriented programming course is designed to introduce students to the fundamental concepts and principles of object-oriented programming (OOP). It aims to provide a solid foundation in OOP, which is a programming paradigm widely used in software development.<br>The course typically begins with an overview of the basic concepts of programming, such as variables, data types, control structures, and functions, to ensure that students have a basic understanding of programming before diving into OOP. Once the foundation is established, the course progresses into the core principles and features of OOP.<br>Throughout the course, students are typically exposed to practical programming exercises and assignments to reinforce the concepts learned. They may also work on projects that require designing and implementing software solutions using OOP principles.<br>By the end of the course, students should have a solid understanding of object oriented programming and be able to apply OOP concepts to design and develop robust, modular, and reusable software solutions. | | | |

**Module 15**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC23112 | Numerical Methods | 5 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 46 |
| **Description** | | | |
| The numerical methods module is a comprehensive course that introduces students to the fundamental techniques used in solving mathematical problems through numerical approximation. This module covers a wide range of topics, including finding roots, solving systems of linear equation interpolation and polynomials. Through a combination of theoretical principles and practical implementation using MATLAB programming language, students gain experience in applying numerical algorithms to solve real-world mathematical problems. The module emphasizes error analysis, stability, and convergence of numerical methods to ensure accurate and reliable results. Students also learn about practical considerations such as round-off errors and truncation errors. By the end of this module, students will have gained proficiency in applying numerical methods to real-world problems and acquired the tools necessary for accurate and reliable mathematical computations. | | | |

**Module 16**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC23113 | Computation Theory | 5 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 92 |
| **Description** | | | |
| Computation theory, also known as the theory of computation, is a branch of computer science that deals with the study of algorithms, computation, and the properties of computational models. It provides a framework for understanding the fundamental limits and capabilities of computational systems. Computation theory also encompasses the study of formal languages, automata theory, and complexity theory. Formal languages are used to describe the syntax and structure of programming languages, as well as other communication systems. They are studied in the context of automata theory and play a crucial role in the study of programming languages, compilers, and parsing techniques. The outcomes of studying computation theory include gaining a deep understanding of the fundamental principles of computation, developing strong problem-solving and algorithmic design skills, and being able to analyze the efficiency and complexity of algorithms. It provides a foundation for advanced studies in computer science and related fields. | | | |

**Module 17**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC23114 | Visual Programming | 6 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| Throughout the module, students will gain practical experience through coding exercises, projects, and collaborative activities. They will also develop problem-solving and critical thinking skills as they tackle real-world challenges in visual programming. The module aims to equip students with the ability to create functional and interactive applications using visual programming techniques, fostering creativity and innovation in software development. | | | |

**Module 18**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOB105 | Baath Regime Crimes in Iraq | 2 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | Lec | 33 | 17 |
| **Description** | | | |
| الوصول بالطالب الاكاديمي الى المستوى المطلوب من المعرفة في طبيعة النظام البعثي المجرم<br>والوصول بالطالب الى مستوى من الفهم والادراك لتلك الجرائم التي ارتكبها النظام البعثي البائد.. | | | |

**Module 19**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC24115 | Algorithms Design and Analysis | 7 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 111 |
| **Description** | | | |
| Algorithms are at the heart of computer science, and the subject has both practical and intellectual applications. This course involves the principles of algorithm design and analysis of algorithms. The emphasis is on choosing appropriate data structures and designing correct and efficient algorithms to operate on these data structures. Topics covered in this course include asymptotic analysis, algorithm design paradigms and applications in sorting and searching, randomized algorithms, amortized analysis, and data structures (heaps and hash tables) and their analysis. The objective of this course can be summarized as follows:<br>• Analyze the asymptotic performance of algorithms.<br>• Exhibit knowledge of important algorithms and data structures.<br>• Apply important algorithmic design paradigms (top down design, divide and conquer) to sorting and searching and learn the methods of analysis.<br>• Apply the theoretical knowledge in practice through the practical part of the course.<br>Create efficient algorithms in common problem-solving scenarios. | | | |

**Module 20**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC24116 | General-purpose Language | 7 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 111 |
| **Description** | | | |
| This module aims to provide students with a comprehensive introduction to the Python programming language, equipping them with essential programming skills and a solid foundation for further studies in computer science. | | | |

**Module 21**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC24117 | Compilers | 6 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | Lect+Lab | 64 | 86 |
| **Description** | | | |
| By studying compilers, the students gain insights into how programming languages are structured, how syntax and semantics are defined, and how languages are transformed into executable code. Understanding the principles and techniques used by compilers allows programmers to write code that can be optimized effectively, resulting in faster and more efficient programs. | | | |

**Module 22**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC24018 | Web Design and Programming | 6 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| Strong internet presence has become essential for every new and growing business today. The first and foremost way for a business to begin online is through designing a spectacular website that can represent its core ideas and the brand. With this need for crafting cool and amazing websites, various career prospects in web designing have rapidly emerged. If you are someone with a knack for programming skills coupled with an eye for crafting stunning aesthetics, you can pursue a web designing course and gather the technical skills and knowledge required to be a web designer. Before opting for that, you should be aware of what a web designing course syllabus is like. | | | |

**Module 23**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOB201 | Arabic Language II | 2 | 4 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 17 |
| **Description** | | | |
| 1-تعلم مهارات الكتابة والاملاء والتعبير الصحيح خلال تطبيق قواعد اللغة العربية بشكل مفصل وتطبيقي على نصوص عربية.<br>2- لفهم الجمع وأنواع الاسماء وكيفية التعامل معها.<br>3- لفهم العدد واستعماله بشكل صحيح من حيث المطابقة والمخالفة<br>للتفريق بين الضاد والظاء.<br>4- للتفريق ومعرفة استعمال التاء المربوطة والتاء الطويلة.<br>5-التمييز بين العلامات الاصلية والفرعية.<br>6- تعلم استعمال الأدوات وعمل كل أداة ومعناها في التعبير. | | | |

**Module 24**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOB202 | English Language II | 2 | 3 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 17 |
| **Description** | | | |
| A pre-intermediate level course builds and further improves language proficiency for second year students/ college of science, The course aims at helping learners to achieve an overall English language proficiency leading to pre-intermediate Independent User of Reference for Languages, developing conversational skills, expressing ideas, and helping learners deal with problems and situations where they meet unpredictable language. The module caters to Second Year students in college, particularly those studying in the field of science. | | | |

**Module 25**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC35119 | Artificial Intelligence | 6 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 71 |
| **Description** | | | |
| The AI course delves into the principles and applications of logic and search techniques in artificial intelligence. Students will explore various logical formalisms, including propositional and predicate logic, and learn how to reason and make inferences using logic-based representations. The course covers search algorithms, such as depth-first search, breadth-first search, and A*, and their application in problem-solving and intelligent agent design. Students will gain hands-on experience in implementing search algorithms and using knowledge representation languages like Prolog. The course also explores advanced topics such as constraint satisfaction, planning, and intelligent search strategies. By the end of the course, students will have a strong understanding of logic and search techniques and their role in AI applications. | | | |

**Module 26**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC35120 | Computer Networks | 6 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 71 |
| **Description** | | | |
| The aim of this module is to help the students understand the main concepts of computer networks related to standards, techniques and protocols that govern computer communications. The course will cover the theoretical and practical implementation of connecting computers using suitable CISCO configuration and network devices in LAB. Also the students will recognize different computer networks devices and their specifications that are available in the market. | | | |

**Module 27**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC35121 | Cryptography | 5 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 61 |
| **Description** | | | |
| The last 40+ years have witnessed a revolution in the area of ȝryptography, bringing real-life security problems to the attention of a vast research community. This revolution created Modern Cryptography, where researchers started rigorously treating and solving several problems that only a few years before were unknown or seemed impossible to solve or only had heuristic solutions. Today Modern Cryptography is a well-established mathematical discipline, with strong connections to several older disciplines such as Complexity Theory, Information Theory, Combinations, Number Theory, and Coding Theory, and several applications to real-life problems. This Applied Cryptography class offers a comprehensive introduction to Modern Cryptography, and, specifically, its main problems, formalism's, solutions, and open questions, with a heavy focus on application aspects, including case studies for real-life uses ofModern Cryptography solutions. | | | |

**Module 28**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC35122 | Web Applications Development | 5 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 61 |
| **Description** | | | |
| Web application development refers to the process of creating software applications that run on web browsers. These applications are typically accessed over the internet and provide users with a variety of functionalities, such as data input, processing, and presentation. | | | |

**Module 29**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC35123 | Software Engineering | 4 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 67 |
| **Description** | | | |
| The software engineering course is concerned with all characteristics and concepts of the newly used models in software analysis and design and helps students to obtain user requirements for software systems through field studies and labor market requirements. It helps students to have knowledge of the initial phases of the software engineering lifecycle, i.e. requirements engineering, software design and be able to apply them in a large-scale industrial setting. In addition, helps students to get a good knowledge for using the modern technologies and methods to analyze user requirements through deduction and analysis skills to enable for developing large software systems and to implement the software development methods in practical projects. | | | |

**Module 30**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC35124 | Computer Architecture | 4 | 5 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 67 |
| **Description** | | | |
| 1. Understand the computer system and basic computer components.<br>2. To understand all physical aspects of computer systems e.g., circuit design, control signals, and memory types.<br>3. To understand the input/output organization and peripheral devices.<br>4. Understand interface as a shared boundary between two separate components of the computer system for communication purposes.<br>5. To understand computer memory as the storage space in the computer and learn its types.<br>6. To learn the concept of multicore, multiprocessor, and multiprogramming Systems. | | | |

**Module 31**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC36125 | Mobile Applications Development | 6 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| Mobile devices are no longer simple voice communication devices. They have become a medium to create voice, music, text, video, and image communications. Importantly, these various interactions can be created and shared on demand by the mobile user. In addition to communication methods, mobile devices are also a tool used to access the Internet, view television and movies, interact with GPS (Global Positioning System), play games, and read and respond to barcode and augmented reality messages. The course exposes students to today's mobile device software development methodologies and programming principles. It provides students with the opportunity to design, develop, deploy and debug applications for the Android platform, enhancing their understanding of mobile development and their judgment of the effectiveness of different development techniques. | | | |

**Module 32**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC36126 | Computer Graphics | 6 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 71 |
| **Description** | | | |
| The course introduces the basic concepts of computer graphics. It provides the necessary theoretical background and demonstrates the application of computer science to graphics. The course further allows students to develop programming skills in computer graphics through programming assignments. The course covers fundamental topics such as graphics representations and transformations. On completion of the course the student will understand the core concepts and mathematical foundations of computer graphics, knows fundamental computer graphics algorithms and data structures, and understands light interaction with 3D scenes. | | | |

**Module 33**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC36127 | Machine Learning | 6 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| This course is a comprehensive overview of machine learning. The goal is to build an understanding of the most common machine learning models. Given the widespread use of modern machine learning techniques, there is an urgent need for programmers and system designers to improve their understanding of modern machine learning techniques. | | | |

**Module 34**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC36128 | Fundamentals of Database Systems | 6 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| This module provides a comprehensive overview of the fundamental concepts and principles underlying modern database systems. Students will gain a solid foundation in understanding databases, their purpose, and their role in managing and organizing data. The module covers topics such as data models, data storage, data retrieval, and data manipulation. Students will explore query languages, database design principles, and the importance of data integrity and security. Through practical examples and exercises, students will improve essential skills in creating and querying databases, as well as understanding the challenges and best practices in managing data effectively. This module serves as a crucial introduction for students entering the field of database design and implementation. Also it provides a strong basis for further studies in database systems. | | | |

**Module 35**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC36129 | Computer and Networks Security | 5 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 92 |
| **Description** | | | |
| In this course, students will gain an understanding of the basic concepts of computer and network security by examining different types of attacks on computer systems and networks. They will also learn how to recognize and prevent these threats from happening, as well as how to spot them if they do occur. | | | |

**Module 36**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| UOB309 | Scientific Research Methodology | 1 | 6 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | **Lect** | 18 | 7 |
| **Description** | | | |
| This course will present an overview of research methodology including basic concepts employed in quantitative and qualitative research methods. Research techniques and methods will be examined for the formulation of hypotheses, development of testable objectives, experimental design, subject selection, data collection, data analysis and interpretation, and report preparation. This course will focus also on laboratory-based methods and simple statistical procedures for the analysis of data. Students will apply the concepts and methods in laboratory exercises. | | | |

**Module 37**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC47130 | Digital Image Processing | 6 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| To learn and understand the fundamentals of digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.<br>Instructional Objectives (IOs):<br>1. To learn and understand the digital image processing<br>2. To learn and understand various image transform used in digital image processing<br>3. To learn and understand various image enhancement technique used in digital image processing<br>4. To learn and understand various image restoration technique and methods used in digital image processing<br>5.To learn and understand various image compression and Segmentation used in Digital Image Processing | | | |

**Module 38**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC47131 | Database Management Systems | 6 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| This module provides an in-depth understanding of the principles and practices involved in managing and manipulating data using relational database systems. Students will learn the fundamental concepts of relational databases, including table structures, relationships, and query languages such as SQL. They will gain skills in designing efficient database schemas, enforcing data integrity through constraints, and optimizing database performance. The module covers topics such as transaction management, concurrency control, and advanced concepts like database recovery and tuning. Through real-world applications and hands-on exercises, students will develop the ability to apply their knowledge to solve practical database problems. Overall, this module equips students with the necessary knowledge and skills to work with relational databases effectively and efficiently. | | | |

**Module 39**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC47132 | Introduction to IoT | 4 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 67 |
| **Description** | | | |
| Introduction to Internet of Things (IoT) course provides a basic understanding of the fundamental concepts, technologies, and applications of the Internet of Things (IoT). Students will explore the architecture of IoT systems, learn about communication protocols, cybersecurity challenges, and management techniques specific to IoT environments. Through practical exercises, students will gain knowledge to implement a simple IoT project that collects data from sensors and transmit the data to the cloud for further processing. | | | |

**Module 40**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC47133 | Operating Systems | 6 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3+2 | **Lect+Lab** | 79 | 71 |
| **Description** | | | |
| This Module covers the fundamentals principles, concepts and functionalities of Operating systems. Explores the different techniques used by the operating system to achieve its goals as resource manager. The course also describes how an application interacts with the operating system and how the operating systems interact with the machine. Also, the course shed light on some of the existing operating systems and how the topics taught in the course are applied in these systems.<br>In this module student can learn :<br>1. Introduction to OS 2. Process Management 3. Memory Management 4.File Systems 5. Device Management 6.Case study : Linux fundamentals | | | |

**Module 41**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC47134 | Information Retrieval | 5 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 61 |
| **Description** | | | |
| The major objective of an information retrieval system is to retrieve the information – either the actual information or the documents containing the information – that fully or partially match the user's query. It gives the students an understanding of the fundamental techniques for hypermedia architectures, design and usability, document management and retrieval, metadata management, and searching the web. Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia. Analyze ranked retrieval of a very large number of documents with hyperlinks between them. | | | |

**Module 42**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC47135 | Research Project I | 3 | 7 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Prac.** | 32 | 43 |
| **Description** | | | |
| This course provides an overview of basic principles for planning, implementing and monitoring development projects. The practical part of the course consists of a project with a focus on software engineering and/or computer security. Students work to define, implement and evaluate a real-world software system. Most of the work in this course is practical to complete the project work, although there are some introductory lectures on software project management and work strategies. Assessment is based on a project proposal, a final project demonstration and report, and on the quality of the software system itself. Students are also required to reflect on their work and to provide contributions to the project. | | | |

**Module 43**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC 48136 | Data Mining | 6 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| To develop problem solving skills and understanding of Data analysis through the application of techniques. And to understand the use of data mining algorithms. This course deals with the basic concept of data mining and analyze the real life data<br>Data mining is the process of sorting through large data sets to identify patterns and relationships that can help solve business problems through data analysis. Data mining techniques and tools enable enterprises to predict future trends and make more-informed business decisions.<br>Data mining is a key part of data analytics overall and one of the core disciplines in data science, which uses advanced analytics techniques to find useful information in data sets. At a more granular level, data mining is a step in the knowledge discovery in databases (KDD) process, a data science methodology for gathering, processing and analyzing data. Data mining and KDD are sometimes referred to interchangeably, but they're more commonly seen as distinct things. | | | |

**Module 44**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC48137 | Cybersecurity | 6 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| Protection of computer systems and networks from attack by malicious actors that may result in unauthorized information disclosure, theft of, or damage to hardware, software, or data. | | | |

**Module 45**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC48138 | Introduction to Robotics | 5 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 61 |
| **Description** | | | |
| Introduction to Robotics is a comprehensive course that explores the principles and applications of robots in various fields. This hands-on course covers topics such as robot components, kinematics, programming, perception, and control. Students will learn to design, build, and program robots, gaining practical skills in robot construction and programming languages. The course emphasizes problem-solving, critical thinking, and teamwork through engaging lab projects and group activities. Topics include robot locomotion, manipulation, computer vision, and autonomous navigation. Additionally, ethical considerations, emerging trends, and real-world applications of robotics will be discussed. By the end of the course, students will have a solid foundation in robotics and be equipped to pursue further studies or careers in the field. | | | |

**Module 46**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC48139 | Multimedia | 6 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Lect+Lab** | 64 | 86 |
| **Description** | | | |
| Main topics to be covered in this course are: An Introduction to Multimedia, Multimedia system properties, interactivity and classification of multimedia, multimedia applications. Multimedia Software tools,<br>Multimedia related technology, Multimedia Storage CD and CD-ROM technology, Multimedia components such as Digital image concepts, types, Colors, image compression, GIF and JPEG – Formats and other image file formats in internet , Basic Sound Concepts (Basic Concept of Audio, Computer representation of sound ( sampling rate, quantization) and Video Fundamentals. MIDI Basic concepts and devices, Comparison between MIDI and Audio files. Also, in the LAB we introduce MM in visual programming /or C# (Audio and Video). This course simply introduces students to the design and production process of developing interactive multimedia, a combination of text, sound, animation, graphics, and video. Students will be given an opportunity to work with a variety of software including programs used for sound and video production, multimedia presentations & image editing. | | | |

**Module 47**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC48140 | Parallel and Distributed Computing | 4 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | **Lect** | 33 | 67 |
| **Description** | | | |
| This course covers a broad range of topics related to parallel and distributed computing, including parallel and distributed architectures and systems, parallel and distributed programming paradigms, parallel algorithms, and scientific and other applications of parallel and distributed computing.<br>In addition, a selection of topics from the following: the challenges faced in constructing parallel and distributed applications, including testing, debugging and performance evaluation. Various implementation techniques, paradigms, architectures and programming languages including: Flynn's taxonomy, MPI, MapReduce, OpenMP, GPGPU, concurrency and multi-threading. | | | |

**Module 48**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| CSC48141 | Research Project II | 3 | 8 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2+2 | **Prac.** | 32 | 43 |
| **Description** | | | |
| This course provides an overview of basic principles for planning, implementing and monitoring development projects. The practical part of the course consists of a project with a focus on software engineering and/or computer security. Students work to define, implement and evaluate a real-world software system. Most of the work in this course is practical to complete the project work, although there are some introductory lectures on software project management and work strategies. Assessment is based on a project proposal, a final project demonstration and report, and on the quality of the software system itself. Students are also required to reflect on their work and to provide contributions to the project. | | | |