

# University of Anbar جامعة الانبار



*First Cycle – Bachelor's Degree (B.Sc.) – Computer Science*  
بكالوريوس – علوم حاسبات



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### 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 (46) 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 الحاسبات للحصول على درجة بكالوريوس في علوم الحاسبات. يقدم البرنامج (٤٦) مادة دراسية، على سبيل المثال، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

### 2. Undergraduate Courses 2023-2024

#### Module 1

Code	Course/Module Title	ECTS	Semester
CSDC110	Computer Technology	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>This module cover computer systems and includes all hardware, software, and Electronic Data. Additionally, the course addresses the principles of modern computing technology, its role in helping to solve real-world problems and the critical issues affecting management. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"><li>1. The student should understand the architecture of any IT systems.</li><li>2. The student should understand the parts of hardware.</li><li>3. The student should understand the system software.</li><li>4. The student should understand the architecture of networks ,protocols and communications devices.</li></ol>			

## Module 2

Code	Course/Module Title	ECTS	Semester
CSDC111	Programming in C++ I	8	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
4	4	123	77
Description			
<p>This module provides an overview of programming languages; and explains the principles of abstraction and modularity. The elements of structured programming are then given before outlining the steps in program design and execution. An introduction to the C++ programming language follows with how to use and apply operators and control statements.</p> <p><b>After completing the module</b>, the student should be able to develop proficiency in the C++ programming language, including a strong understanding of its syntax, semantics, data types, control structures, functions, and object-oriented programming concepts.</p>			

## Module 3

Code	Course/Module Title	ECTS	Semester
CSDC112	Logic Design I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3	93	57
Description			
<p>This module demonstrates a solid understanding of digital logic principles, including Boolean algebra, logic gates, truth tables, and the concept of binary representation. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"><li>1. Understand number systems and codes and conversion between them.</li><li>2. Understand the Boolean expression and how to apply it.</li><li>3. Recognize among different logic gates and how to use them.</li><li>4. Understand how to design a logic circuit.</li><li>5. Understand using K-map for simplification.</li></ol>			

**Module 4**

Code	Course/Module Title	ECTS	Semester
CCIT060	Mathematics	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	3	93	57
Description			
<p>This module aims to provide students with a solid foundation of core mathematical concepts and theories. This includes topics such as algebra, calculus, geometry, discrete mathematics, probability, and statistics. The aim is to ensure that students have a comprehensive understanding of fundamental mathematical principles. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Understand and use basic mathematical terminology.</li> <li>2. Understand the role of formal definitions and proofs and be able to apply them in problem solving.</li> <li>3. Understand the basics of propositional and predicate logic.</li> <li>4. Understand the basics of elementary set theory.</li> <li>5. Understand the basics of mathematical relations and functions.</li> <li>6. Understand the basics of graph theory.</li> </ol>			

**Module 5**

Code	Course/Module Title	ECTS	Semester
UOA003	English Language I	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	33	17
Description			
<p>This module focuses on developing the specific skills required for academic studies and exploring strategies for success in academic. New texts, topics, and design, integrated-skills syllabus with a clear grammar focus, new version of Headway iTools – whole book onscreen, Headway iTutor – new interactive self-study DVD-ROM, included with the Student’s Book.</p>			

**Module 6**

Code	Course/Module Title	ECTS	Semester
UOA005	Democracy and Human Rights	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	0	33	17

Description
<p>تهدف هذه المادة الى تعليم الطلبة على أساسيات حقوق الإنسان وقوانينها والتعرف على الحقوق وأهم الإشكاليات والتحديات التي تواجهها. اخذ مفردات هذه المادة تساعد على:</p> <p>١- أن يعرف الطالب مفهوم الحقوق وقوانينها وتطبيقاتها .  ٢- أن يعرف الطالب كيفية المشاركة في نشر الحقوق وتطبيقها بالعمل الواقعي الحقيقي.  ٣- القدرة على استخدام الحقوق وسيلة من أجل التعايش السلمي بين مكونات المجتمع وجميع المخلوقات .  ٤- القدرة على مشاركة الآخرين في نشر هذه الحقوق .</p>

### Module 7

Code	Course/Module Title	ECTS	Semester
CSDC120	Microprocessors	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>This module covers the following issues:</p> <ol style="list-style-type: none"> <li>1. Evolution of microprocessors, 8086 Microprocessor - Architecture and signals.</li> <li>2. Memory organization</li> <li>3. Minimum and maximum mode of operation.</li> <li>4. Minimum mode Timing Diagram.</li> <li>5. Comparison of 8086 and 8088.</li> </ol>			

### Module 8

Code	Course/Module Title	ECTS	Semester
CCIT061	Discrete Structures	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	72
Description			
<p>The model of discrete structures aims to study the 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. More precisely:</p> <ol style="list-style-type: none"> <li>1- To describe the aim of study discrete mathematics</li> <li>2- To understand what difference between ordinary math and discrete math.</li> <li>3- To understand what the relation between computer science and math</li> <li>4- To learn the operation between the difference objects of math.</li> <li>5- To apply the relation between this objects.</li> </ol>			

**Module 9**

Code	Course/Module Title	ECTS	Semester
CSDC121	Programming in C++ II	8	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	4	123	77
Description			
<p>This module provides the principles of abstraction and modularity of structure programming. Functions and arrays in C++ are then discussed, finally ending the course with a study of structures, files and pointers in C++. Learn how to use the advanced tools which help programmers to write fast, portable programs. The main principles of programming and the development of programming languages are considered.</p>			

**Module 10**

Code	Course/Module Title	ECTS	Semester
CSDC122	Logic Design II	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	93	57
Description			
<p>This module covers the following issues:</p> <ul style="list-style-type: none"> <li>- The student should understand encoder, decoder and multiplexers</li> <li>- The student should understand synchronous logic circuit</li> <li>- The student should understand flip-flops and how to use them</li> <li>- The student should understand registers and their types</li> <li>- The student should understand counters and their types</li> <li>- The student should understand ROM and PLA implementation</li> </ul>			

**Module 11**

Code	Course/Module Title	ECTS	Semester
UOA001	Arabic Language I	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2	0	33	17
Description			
<p>تهدف هذه المادة الى:</p> <ol style="list-style-type: none"> <li>١. تعليم الطلبة على أساسيات اللغة العربية وقواعدها</li> <li>٢. تعليم الطلبة على كيفية الاعراب</li> <li>٣. أن يتعرف الطالب على قواعد اللغة العربية</li> <li>٤. أن يعرف الطالب كيفية بناء الجمل واستخراجها للعنوان المطلوب</li> <li>٥. القدرة على استعمال العبارات الصحيحة</li> <li>٦. القدرة على مشاركة الآخرين في الحوار الصحيح</li> </ol>			

### Module 12

Code	Course/Module Title	ECTS	Semester
CSDC123	Communication Skills	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	33	17
Description			
<p>This module is essential for college students as they play a vital role in academic success, personal development, and future career prospects. After completing the module, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Written Communication: Strong writing skills are crucial for college students as they frequently need to write essays, reports, and assignments.</li> <li>2. College students should focus on improving their grammar, punctuation, and overall writing style to communicate their thoughts accurately.</li> <li>3. Listening Skills: Effective communication is a two-way process, and listening plays a vital role in it. College students should develop active listening skills, which involve paying full attention to the speaker, understanding the message being conveyed, and responding appropriately.</li> <li>4. Presentation Skills: Delivering presentations is a common requirement in college. Students should develop the ability to organize and present information in a structured and engaging manner.</li> </ol>			

### Module 13

Code	Course/Module Title	ECTS	Semester
CSDC210	Database	7	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	4	108	67

Description
<p>This module aims to create, update, and store the static and the dynamic objects to be used in the simulation, both related to the infrastructure (supply) and to the demand. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Understand relational data model in terms of data structure, data integrity, and data manipulation.</li> <li>2. Understand and create conceptual database models utilizing entity-relationship.</li> <li>3. Design data structures that will limit redundancy and enforce data integrity while conforming to organizational requirements utilizing normalization methodology.</li> <li>4. Understand the theory behind the relational data model as it applies to interactions with current database management systems.</li> <li>5. Interpret a given data model to query the database and transform the data into information using SQL (Structured Query Language).</li> <li>6. Implement a data model in a current RDBMS.</li> <li>7. Create reports based on transactional data, including elements such as data groupings and summary values.</li> </ol>

#### Module 14

Code	Course/Module Title	ECTS	Semester
CSDC211	Object Oriented Programming	8	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	4	123	77
Description			
<p>This module covers a programming language, system or software methodology that is built on the concepts of logical objects. Usually, the Object Oriented Programming module correspond to classes, packages, files, and components. <b>After completing the module</b>, the student should be able to:</p> <ul style="list-style-type: none"> <li>• Apply the fundamental constructs of imperative and object-oriented programming, and data structures</li> <li>• Write, test and debug computer programs</li> <li>• Design complete computer programs to solve given software problems</li> <li>• Demonstrate an understanding of the advantages and limitations of OOP</li> </ul>			

#### Module 15

Code	Course/Module Title	ECTS	Semester
CSDC212	Data Structures	7	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	4	108	67



Description
<p>This module provides a formal model that describes the way the data elements are organized. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Utilize different data structures</li> <li>2. Understand why this data structure is better than the other one.</li> <li>3. Choose the best data structure for your algorithm.</li> <li>4. Learn how to deal with your problem, building its algorithm and fitting the best data structures to it.</li> </ol>

### Module 16

Code	Course/Module Title	ECTS	Semester
CSDC213	Advanced Mathematics	4	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	37
Description			
<p>This To equip students with the mathematical and statistical knowledge and skills necessary for successful subsequent degree-level study in computer science. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>A- Knowledge and Understanding               <ol style="list-style-type: none"> <li>A1. Understand the concept of ordinary and partial</li> <li>A2. Understand the method of solving the first order differential equation</li> <li>A3. Understand the method of solving second order differential equation</li> <li>A4. Understand the Laplace transform</li> <li>A5. Understand the Fourier series</li> </ol> </li> <li>B- Subject-specific skills               <ol style="list-style-type: none"> <li>B1. explain what mean of ordinary and partial</li> <li>B2. classify the method of solving</li> <li>B3. Classify the differential equation</li> </ol> </li> </ol>			

### Module 17

Code	Course/Module Title	ECTS	Semester
UOA006	The crimes of the defunct Ba'ath party	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	33	17
Description			
<p>This module covers the following issues: The concept of crimes and their types, definition of crime and its terminology, types of</p>			

international crimes, decisions issued by the Supreme Criminal Court, psychological and social crimes and their effects, and environmental crimes.

#### Module 18

Code	Course/Module Title	ECTS	Semester
UOA002	Arabic Language II	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	33	17
Description			
<p>تهدف هذه المادة الى:            تعليم الطلبة كيفية كتابة الأوراق البحثية والتقارير والمقالات والتحليل النصي. يتم تقييم الطلاب من خلال الاختبارات والمشاريع والمناقشات الفصلية. يهدف تعلم مادة العربي في مرحلة الجامعات إلى تزويد الطلاب بمهارات لغوية وأدبية متقدمة، وتعزيز فهمهم للثقافة العربية. كما يساعدهم في تطوير مهارات التواصل والتفكير النقدي والبحث العلمي</p>			

#### Module 19

Code	Course/Module Title	ECTS	Semester
CSDC220	Computational Theory	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	47
Description			
<p>This module introduce general models of computation such as finite state automata and Turing machines and their relationship to classes of languages, and use these models to explore the limits of the power of computers. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>Find occurrences of words, phrases, or other patterns; Software for verifying systems of all types that have a finite number of distinct states, such as communication protocols or protocols for secure exchange of information.</li> <li>Knowledge and understanding           <ul style="list-style-type: none"> <li>Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design.</li> <li>Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Stack's, Turing machines, and Grammars</li> </ul> </li> <li>Cognitive skills (thinking and analysis).           <ul style="list-style-type: none"> <li>Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics</li> <li>Be able to design sample automata</li> </ul> </li> <li>Communication skills (personal and academic).</li> </ol>			

- Be able to minimize FA's and Grammars of Context Free Languages.

### Module 20

Code	Course/Module Title	ECTS	Semester
CSDC221	python	7	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
4	3	108	67
Description			
<p>This module covers a programming language, system or software methodology that is built on the concepts of logical objects. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Introduce the principles of a higher-level programming language in python.</li> <li>2. Analyze a problem statement to develop a mental model of objects necessary to create a software architecture</li> <li>3. Utilize object-oriented programming to frame software architectures, with care towards separation of concerns and abstraction</li> <li>4. Gain skills in designing, and programming software for reuse of code.</li> </ol>			

### Module 21

Code	Course/Module Title	ECTS	Semester
CSDC222	Algorithms	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>This section covers the algorithms that can be used to store and organize data. An algorithm is a collection of steps to solve a particular problem. Learning data structures and algorithms allow us to write efficient and optimized computer programs. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. To demonstrate performance of algorithms with respect to time and space complexity.</li> <li>2. To explain graph and tree traversals.</li> <li>3. To explain the concepts greedy method and dynamic programming. Applying for several applications like knapsack problem, job sequencing with deadlines, and optimal binary search tree, TSP and so on respectively.</li> <li>4. To illustrate the methods of backtracking and branch bound techniques to solve the problems like n-queens problem, graph coloring and TSP respectively.</li> <li>5. To familiarize the concepts of deterministic and non-deterministic algorithms.</li> </ol>			

**Module 22**

Code	Course/Module Title	ECTS	Semester
CCIT062	Numerical Analysis	4	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	2	63	37
Description			
<p>This module introduces students to the study of the numerical analysis, methods, applications and its relationship with the real problems. Teach train the students to deal with the numerical process in the future in logic and right style. Additionally, <b>After completing the module</b>, the student should be able to study of numerical approximation techniques for problems of continuous mathematics. We consider both theoretical questions regarding how, why and when numerical methods work, and practical implementation using computer programs. Its aims are:</p> <ol style="list-style-type: none"> <li>1. Understanding the concept of numerical analysis, its methods and applications.</li> <li>2. Explain the concept of the Matrices and its application in numerical analysis.</li> <li>3. Understanding the relationship between the numerical methods and the real problems and how to deal with it.</li> </ol>			

**Module 23**

Code	Course/Module Title	ECTS	Semester
CCIT063	Computer Networks	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	3	93	57
Description			
<p>The Computer Networks module provides the students an introduction to the fundamentals of packet switching technologies as used in the internet. Emphasis is placed on core Internet protocols such as IP and TCP. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Understanding Network Fundamentals: Introduce students to the basic concepts and components of computer networks, including network architectures, protocols, and network layers.</li> <li>2. Exploring Network Protocols: Familiarize students with various network protocols, such as TCP/IP, UDP, HTTP, FTP, DNS, and their roles in facilitating communication and data transfer in computer networks.</li> <li>3. Studying Network Topologies and Technologies: Explore different network topologies, such as bus, star, ring, mesh, and hybrid, and technologies such as Ethernet, Wi-Fi, and cellular networks.</li> <li>4. Learning Network Design and Implementation: Develop skills in designing and implementing computer networks, including network planning.</li> </ol>			

**Module 24**

Code	Course/Module Title	ECTS	Semester
UOA004	English Language 2	2	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	0	33	17
Description			
<p>This module focuses on developing the specific skills required for academic studies and exploring strategies for success in academic learning. It also offers guidance in key study areas and provides plenty of practice to encourage learner independence..</p>			

**Module 25**

Code	Course/Module Title	ECTS	Semester
CSDC310	Visual Programming	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
4	2	93	57
Description			
<p>This module provides students to understand the process in words that are understandable to humans, as opposed to a traditional text-based computer language that forces the developer to think like a machine. It aims:</p> <ol style="list-style-type: none"> <li>1. The course aims to introduce students to the fundamental concepts of C# programming language, including syntax, data types, variables, control structures (loops, conditional statements), and functions.</li> <li>2. The course focus on teaching students how to use C# to develop practical software applications. This includes topics such as input/output operations, file handling, exception handling, and basic user interface development.</li> <li>3. The course also focus on teaching students Working with data such as arrays, collections, and databases.</li> <li>4. Understanding how to debug and troubleshoot code is an important skill for any programmer.</li> </ol>			

**Module 26**

Code	Course/Module Title	ECTS	Semester
CSDC311	Computer Graphics	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57

Description
<p>This section includes a description of the computer-based generation of digital images—mostly from two-dimensional models (such as 2D geometric models, text, and digital images) and by techniques specific to them. It aims To introduce students to the fundamental concepts of computer graphics, including the principles of digital image representation, rasterization, and vector graphics. This includes understanding concepts such as modeling, transformation, projection, rasterization, and rendering. <b>After completing the module</b>, the student should be able to:</p> <ul style="list-style-type: none"> <li>• Be able to explain the basic algorithms used in computer graphics, their advantages and limitations.</li> <li>• Be able to manipulate the equations and data structures involved in computer graphics algorithms</li> </ul>

### Module 27

Code	Course/Module Title	ECTS	Semester
CSDC312	Computer Architecture	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	3	93	57
Description			
<p>This module provides <b>an overview of computer architecture</b>, then progresses to topics on how computer systems execute programs, store information, and communicate. It aims to:</p> <ol style="list-style-type: none"> <li>1. To understand the structure, function and characteristics of computer systems.</li> <li>2. To understand the design of the various functional units and components of computers.</li> <li>3. To identify the elements of modern instructions sets and their impact on processor design.</li> <li>4. To explain the function of each element of a memory hierarchy.</li> <li>5. To identify and compare different methods for computer I/O.</li> </ol> <p>The Outcomes of Module Learning is Enabling students to verify performance analysis, memory system hierarchy, pipelining, and communication.</p>			

### Module 28

Code	Course/Module Title	ECTS	Semester
CSDC321	Wireless Networks	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>The Computer Networks module reviews emerging networking technologies, which might include topics such as future routing protocols, IPv6 transition, and software-defined networking. <b>After completing the module</b>, the student should be able to:</p>			

1. Design and implement a local area network (LAN) or a wide area network (WAN), considering factors such as network topology, security, and scalability.
2. Understand the principles and protocols of wireless networking, including Wi-Fi and cellular networks.
3. Evaluate network security risks and implement appropriate security measures, including authentication, encryption, and intrusion detection systems.
4. Demonstrate knowledge of network management and monitoring techniques, including network monitoring tools and protocols.

### Module 29

Code	Course/Module Title	ECTS	Semester
CSDC323	Mobile Applications Programming	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>This module is concerned with the design, implementation and testing of applications for the Android platform. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Understand Mobile Development Fundamentals: Introduce students to the fundamental concepts and principles of mobile application development, including platform architecture, user interface design, and application lifecycle.</li> <li>2. Learn Mobile Programming Languages and Tools: Familiarize students with programming languages and frameworks commonly used in mobile app development, such as Java/Kotlin for Android and Swift/Objective-C for iOS. Introduce them to integrated development environments (IDEs) and software development kits (SDKs) specific to mobile platforms.</li> <li>3. Explore User Interface Design: Teach students the principles of designing effective and user-friendly interfaces for mobile applications. Cover topics such as screen layouts, navigation patterns, input controls, and responsiveness.</li> <li>4. Understand Mobile Application Architecture: Introduce students to the architecture patterns commonly used in mobile app development, such as Model-View-Controller (MVC) or Model-View-View Model (MVVM). Explore topics such as data persistence, networking, and integration of device features (e.g., camera, GPS).</li> </ol>			

### Module 30

Code	Course/Module Title	ECTS	Semester
CSDC320	Multimedia	7	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	5	108	67
Description			

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

### Module 31

Code	Course/Module Title	ECTS	Semester
CSDE223	Internet of Things	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>This module introduces the IoT, which extends Internet connectivity from computers and related devices to other physical devices or common objects and leverages from technologies such as embedded systems, wireless sensors, and automation. <b>After completing the module</b>, the student should be able to:</p> <ul style="list-style-type: none"> <li>• Understand key concepts relating to Internet of Things (IoT), including common structure and requirements</li> <li>• Recognize examples of consumer, commercial, industrial, and infrastructural applications of IoT.</li> <li>• Identify current trends in IoT, including the evolution of IoT components and the important role played by governance.</li> <li>• Understand ethical, security, and interoperability considerations around adoption of IoT, and consider how IoT could be implemented in a given scenario.</li> <li>• Consider appropriate solutions and models for implementing cloud computing in a given scenario or situation.</li> </ul>			

### Module 32

Code	Course/Module Title	ECTS	Semester
CSDC322	Compilers	7	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	4	108	67
Description			
<p>The objective the compiler module is to understand the basic principles of compiler design, its various constituent parts, algorithms and data structures required to be used in the compiler. <b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the fundamental concepts of compiler design: Students should be able to</li> </ol>			



comprehend the basic principles, techniques, and components involved in designing and implementing compilers.

2. Analyze and describe the various phases of a compiler: Students should be able to explain the different phases of a compiler, including lexical analysis, syntax analysis, semantic analysis, intermediate code generation, optimization, and code generation.
3. Implement a compiler: Students should gain practical experience by implementing a simple compiler for a programming language. This may involve designing and developing the lexical analyzer, parser, semantic analyzer, and code generator.
4. Apply formal language theory: Students should understand formal languages, regular expressions, context-free grammars, and automata theory, and be able to apply this knowledge to analyze and manipulate programming languages.
5. Test and debug compilers: Students should develop skills in testing and debugging compilers.

### Module 32

Code	Course/Module Title	ECTS	Semester
CSDC313	Software Engineering	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	3	93	57

#### Description

This module deals with the design, development, testing, and maintenance of software applications. Software engineers apply engineering principles and knowledge of programming languages to build software solutions for end users. **After completing the module**, the student should be able to:

1. Understand the fundamental principles, concepts, and practices of Software Engineering, including the importance of following a systematic and disciplined approach to software development.
2. Apply software development methodologies and processes, such as the Software Development Life Cycle (SDLC), to analyze, design, implement, test, and maintain software systems.
3. Elicit, analyze, document, and manage software requirements effectively, considering stakeholders' needs and system constraints.
4. Design software systems and architectures that are modular, scalable, and maintainable, applying software design principles, architectural styles, and design patterns.
5. Implement and execute software testing techniques to verify and validate software functionality, ensuring the delivery of high-quality software systems.

### Module 33

Code	Course/Module Title	ECTS	Semester
UOA019	Research methodology	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	2	63	37

#### Description

This module explain how a student intends to carry out their research. It is broadly defined as the application of theories, concepts and techniques of research activities to perform scientific research works. **After completing the module**, the student should be able to:

1. To familiarize students with the research process, including the various stages involved, from formulating a research question to presenting findings.
2. To develop students' skills in conducting research, including identifying research problems, designing appropriate research methods, collecting and analyzing data, and drawing valid conclusions.
3. Familiarity with research design: The course focuses on introducing different research designs, such as experimental, correlational, qualitative, and quantitative, and helps students understand their strengths, limitations, and appropriate applications.
4. To conduct a comprehensive review of existing literature on a specific topic, identify gaps in knowledge, and situate their research within the broader scholarly context.
5. Ethical considerations: The course emphasizes the importance of ethical conduct in research, such as obtaining informed consent, protecting participants' rights, and maintaining integrity in data collection, analysis, and reporting.
6. To learn various data collection methods, including surveys, interviews, observations, and experiments. They also gain knowledge about data analysis techniques, including descriptive statistics, inferential statistics, and qualitative analysis.
7. Research proposal development: The course may include practical exercises or assignments that involve developing a research proposal. Students learn how to formulate research questions, create a research design, select appropriate methods, and outline a research plan.
8. Critical thinking and problem-solving: The course encourages students to think critically about research problems, evaluate research designs and methodologies, and develop problem-solving skills to overcome challenges encountered during the research process.
9. To communicate their research effectively through various means, such as research reports, academic papers, oral presentations, and posters.

#### Module 34

Code	Course/Module Title	ECTS	Semester
CSDC410	Operating Systems I	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57

#### Description

This module involves a number of interfaces for examining and specifying information about the OS environment of the host machine. The OS module aims:

1. To critically understand the specialist theories, principles, and concepts of modern operating systems.
2. To explain the fundamental structure of a modern operating system and its core functions and services.
3. To critically examine and evaluate different strategies and techniques used by operating systems to manage computer resources.
4. To examine the algorithmic ideas integrated into the design and implementation of different operating systems.

- To understand how operating systems manage resources such as processors, memory, and I/O.

The Outcomes of Module Learning is Enabling students to obtain an understanding and knowledge of the components of an operating system.

### Module 35

Code	Course/Module Title	ECTS	Semester
CSDC411	Computer Security 1	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	3	93	57
Description			
<p>This Module refers to controls and measures that guarantee the confidentiality, integrity and availability of the information processed and stored by a computer. The module aims:</p> <ol style="list-style-type: none"> <li>To explore the concepts of information security attacks, services, and mechanism.</li> <li>To make students familiar with the basic concepts of applied cryptography, including classical cryptography and modern secret key cryptography.</li> <li>To explain the mathematical foundation of modern cryptography, especially number theory and finite fields.</li> <li>To highlight the practical applications and modes of operation of block ciphers.</li> </ol> <p><b>After completing the module</b>, the student should be able to:</p> <ol style="list-style-type: none"> <li>Describe the basic mathematical and technical issues relating to information security.</li> <li>Learning how to leverage these concepts to protect computers from external threats.</li> </ol>			

### Module 36

Code	Course/Module Title	ECTS	Semester
CSDC412	Artificial Intelligence	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	4	108	42
Description			
<p>This module covers the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision. The module aims are:</p> <ol style="list-style-type: none"> <li>Understanding of AI definitions, characteristics, and types.</li> <li>Distinguishing between AI search techniques.</li> <li>This module aims to introduce students to the meaning of the scientific term "Artificial Intelligence" and its applications in computer science, engineering, and other related fields.</li> </ol>			

**Module 37**

Code	Course/Module Title	ECTS	Semester
CSDC413	Digital Image Processing	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	3	93	57
Description			
<p>This module describes the process of transforming an image into a digital form and performing certain operations to get some useful information from it. The module aims are:</p> <ol style="list-style-type: none"> <li>1. Explaining the concept of image processing to students and its various applications.</li> <li>2. Empowering students to understand the types of image processing.</li> <li>3. Empowering students with the necessary skills to perform image processing, write relevant algorithms, and employ methods for visualization and digital image manipulation.</li> </ol> <p>After completing the module, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Understanding the concept of image processing and its various applications.</li> <li>2. Understanding how images are represented and displayed on the screen..</li> <li>3. Understanding and acquiring knowledge of different methods of image processing.</li> <li>4. Understanding and gaining knowledge of various algorithms used in image processing.</li> <li>5. Providing the student with the skill of representing two-dimensional arrays.</li> </ol>			

**Module 38**

Code	Course/Module Title	ECTS	Semester
CSDE414	Game Programming	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
3	3	93	57
Description			
<p>This module presents an introduction to the programming concepts and techniques for developing games. The module aims to:</p> <ol style="list-style-type: none"> <li>1. Understand the fundamentals of game development.</li> <li>2. Understand the principles of physics in games.</li> <li>3. Implement collision detection and response.</li> <li>4. Simulate realistic movements and interactions.</li> </ol> <p>After completing the module, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate a solid understanding of the fundamentals of game programming and design principles.</li> <li>2. Apply programming concepts and techniques to develop game mechanics and functionality.</li> <li>3. Utilize game development tools and engines (e.g., Unity, Unreal Engine, or Godot) to create and prototype games.</li> </ol>			

**Module 39**

Code	Course/Module Title	ECTS	Semester
CSDC420	Operating Systems II	5	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	3	78	47
Description			
<p>This module aims to:</p> <ol style="list-style-type: none"> <li>1. To explain the fundamental structure of a modern operating system and its core functions and services.</li> <li>2. To explain the fundamental structure of a modern operating system and its core functions and services.</li> </ol> <p>After completing the module, the student should be able to</p> <ol style="list-style-type: none"> <li>1. use a range of approaches to critically analyze and evaluate practices of operating systems in identifying, defining, and solving problems by using alternative effective and efficient algorithms.</li> <li>2. Critically analyze and evaluate the performance and effectiveness of different algorithms used by different operating systems.</li> <li>3. Extend knowledge in operating systems to construct specific and effective solution to manage and control computer resources.</li> </ol>			

**Module 40**

Code	Course/Module Title	ECTS	Semester
CSDC421	Computer Security II	5	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	3	78	47
Description			
<p>This module provides a strong foundation on the fundamentals of the basic applications of public key systems in key distribution and digital signatures. It aims to:</p> <ol style="list-style-type: none"> <li>1. To explore the concepts of cryptographic key distribution and the limitation of symmetrical systems in this area.</li> <li>2. To make students familiar with the basic concepts of public key cryptography and hash functions.</li> </ol> <p>After completing the module, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Interpret how technology and theoretical advances can threat existing public key systems.</li> <li>2. Demonstrate skills in using some public key algorithms for various applications.</li> <li>3. Demonstrate skills in applying cryptographic hash functions for message authentication.</li> <li>4. Describe the social and ethical issues relating to viruses and other malicious codes.</li> </ol>			

**Module 41**

Code	Course/Module Title	ECTS	Semester
CSDC422	Machine Learning	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>In this module, Students will learn about the machine learning and biologically inspired computation. It aims to understand how designing a smart system for solving daily life problems. After completing the module, the student should be able to tackle complex problems that are difficult for traditional computing methods. Machine Learning Course aims to equip students with a solid foundation of learning algorithms concepts and theories, including supervised and unsupervised learning. Students are expected to have a comprehensive understanding of the fundamental concepts and techniques of machine learning, regression modules, naive bayes, and more advanced concepts including support vector machine and neural networks.</p>			

**Module 42**

Code	Course/Module Title	ECTS	Semester
CSDC423	Web Development	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	4	93	57
Description			
<p>This module refers to the coding and programming side of website production. It covers the main tools and languages which are used for Website development: Hypertext Markup Language (HTML), Cascading Style Sheets (CSS) and JavaScript. It aims to:</p> <ol style="list-style-type: none"> <li>1. Introduction to the design, creation, and maintenance of web pages and websites.</li> <li>2. How to critically evaluate website quality.</li> <li>3. Learn to create and manipulate images.</li> </ol> <p>After completing the module, the student ability should be Enhanced:</p> <ol style="list-style-type: none"> <li>1. Students will be able to use a variety of strategies and tools to create websites.</li> <li>2. Students will develop awareness and appreciation of the myriad ways that people access the web and will be able to create standards-based websites that are accessible and usable by a full spectrum of users.</li> </ol>			

### Module 43

Code	Course/Module Title	ECTS	Semester
UOA020	Project	8	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
0	8	123	77
Description			
The project in computer science aims to leverage software and artificial intelligence techniques and data analysis to identify areas of code that can be optimized and provide intelligent recommendations for improvement. The expected outcomes of the project include improved code quality, enhanced software performance, and increased efficiency in software development.			

### Contact

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