Northern Technical University
الجامعة التقنية الشمالية

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

Computer Engineering Techniques بكالوريوس - هندسة تقنيات الحاسوب

Networks and communication branch *فرع الشبكات والاتصالات*

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Computer Engineering Techniques to gain the Bachelor of Technical Engineering degree. The program delivers (43) 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 تقنيات هندسة الحاسوب للحصول على درجة بكالوريوس الهندسة التقنية. يقدم البرنامج (43) مادة دراسية ، 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
COE111	English Language	3	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
The aim of this English Language Lecture is to provide students with a comprehensive understanding of the English language, including its structure, usage, and various linguistic aspects. The lecture aims to enhance students' language skills and improve their overall proficiency in English.			

Module 2

Code	Course/Module Title	ECTS	Semester
COE112	Engineering drawings	4	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	4	62	38

Description
1-Enabling students to obtain knowledge and understanding in the subject of engineering drawing and using the computer through the AutoCAD program 2- Understanding and teaching students the basics of engineering drawing related to computer engineering 3- Knowing the correct methods of engineering drawing using the computer and how to apply them in the AutoCAD program in the fields of engineering and computer engineering. 4- Increasing the student's experience in identifying drawing and designing engineering and electronic shapes and drawing connections and electrical circuits.

Module 3

Code	Course/Module Title	ECTS	Semester
COE113	Differentiation and Integration	7	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	92	83
Description			
1. Distinguish the basic principles of the function and its limits. 2. Define the derivative, its applications, and how to solve it. 3. Distinguish the methods of integration, its applications, and how to solve them. 4. Apply the basic principles of matrix and how to solve linear equations.			

Module 4

Code	Course/Module Title	ECTS	Semester
COE114	Electrical engineering fundamentals.	8	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	76
Description			
This course is an introductory course in electric circuit analysis. It mainly deals with the basic concept of electrical circuits and introduces the principles and theories for DC and AC circuit analyses. The course aims: 1. To introduce the basic elements of electrical circuits. 2. To understand voltage, current, and power from a given circuit. 3. To understand and apply various techniques and theorems to analyze electrical circuits. 4. To conduct laboratory experiments to understand practically the fundamental concepts of electrical circuits. 5. To develop problem solving skills and understanding of circuit theory through the application of techniques.			

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Module 5

Code	Course/Module Title	ECTS	Semester
COE115	Computer Programming	8	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	76
Description			
1. To develop problem solving skills by splitting the problem into small steps. 2. This course aims to provide the students with an appreciation of the role of computers programming language level 1. 3. It aims to provide the students the steps of designing the algorithms and flowcharts to simplified programming in C++.			

Module 6

Code	Course/Module Title	ECTS	Semester
COE121	Human rights and democracy	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	0	62	38
Description			
This section includes a description of the module, 100-150 words			

Module 7

Code	Course/Module Title	ECTS	Semester
COE122	Workshops	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	4	62	38
Description			
The educational objectives of this course are • To focus on Electrical safety & equipment earthing • To address the underlying concepts of wiring of various electrical installations. • To study control & power circuit of different starters			

Module 8

Code	Course/Module T Computer applicationsitle	ECTS	Semester
COE123	Computer applications	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	81
Description			
MATLAB is a widely used programming language and computational tool for numerical analysis, data visualization, and scientific computing. In undergraduate curricula, MATLAB teaching goals include developing students' skills in programming, data analysis, and problem solving, as well as providing them with a practical understanding of mathematical concepts and the analysis of complex computations and algorithms.			

Module 9

Code	Course/Module Title	ECTS	Semester
COE114	Logic circuits	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	76
Description			
1. To develop problem solving skills and understanding of digital circuits through the application of techniques. 2. To understand all types of number systems and the conversion between these types. 3. This course deals with the basic concept of digital circuits. 4. This is the basic subject for all logic gates. 5. To understand the basic concepts of arithmetic circuits. his section includes a description of the module, 100-150 words			

Module 10

Code	Course/Module Title	ECTS	Semester
COE125	Computer organization	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	81
Description			
1- Giving the student information about the basic concepts of installing computers, their components and peripheral devices.			

2- Proficiency in the use and maintenance of computers.
3- Design and installation of the main memory of the computer and its programming

Module 11

Code	Course/Module Title	ECTS	Semester
COE211	English Language	3	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
The aim of this English Language Lecture is to provide students with a comprehensive understanding of the English language, including its structure, usage, and various linguistic aspects. The lecture aims to enhance students' language skills and improve their overall proficiency in English.			

Module 12

Code	Course/Module Title	ECTS	Semester
COE212	Mathematics	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	92	58
Description			
1. Define vectors and how to solve them. 2. Acquire the theoretical concepts of dealing with linear and nonlinear differential equations and solving them. 3. .Apply the integration of two or more variables and relate it to solving differential equations. 4. .Understand matrices and their applications in solving mathematical equations. 5. Define the complex number and use it to derive the analytic function.			

Module 13

Code	Course/Module Title	ECTS	Semester
COE213	Computer architecture	8	
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	76
Description			
1. Provide an understanding of the architecture of digital computers, with an emphasis on 8085 and 8086 microprocessors.			

2. Teach students about different aspects of microprocessor functioning such as memory addressing, I/O addressing, bus timing, and interrupt types.
3. Introduce students to advanced topics such as software architecture, pipeline, memory segmentation, and data organization.
4. Teach students about the 8086 instruction set, memory interface circuits, and I/O interface circuits.

Module 14

Code	Course/Module Title	ECTS	Semester
COE214	Object Oriented Programming	8	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	76
Description			
1. To develop problem solving skills by splitting the problem into small steps. 2. This course aims to provide the students with an appreciation of the role of computers programming language level 1. 3. It aims to provide the students the steps of designing programs in object oriented in in C++.			

Module 15

Code	Course/Module Title	ECTS	Semester
COE215	Data base systems	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	64	61
Description			
The aim of this Database Lecture is: 1. To provide students with a comprehensive understanding of the fundamental concepts and principles of databases. 2. To familiarize students with the importance and applications of databases in various domains. 3. To enable students to design, develop, and manage relational databases effectively. 4. To introduce students to database management systems (DBMS) and their role in data organization and retrieval. 5. To explore emerging trends and advancements in the field of databases.			

Module 16

Code	Course/Module Title	ECTS	Semester
COE221	Measurements and instruments	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

4	2	94	56
Description			
In university curricula, the subject of electrical and electronic devices and measurements typically aims to provide students with a fundamental understanding of electrical and electronic systems, devices, and the techniques used to measure and analyze them.			

Module 17

Code	**Course/Module Title**	**ECTS**	**Semester**
COE222	Communications fundamental	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			
This module aims to provide a comprehensive understanding of the fundamentals of communication, focusing primarily on signals and systems. It will delve into signal and system classifications, energy and power considerations, and in-depth exploration of Fourier series and transforms. The module will also introduce key aspects of modulation and demodulation, covering both amplitude and angle modulation, and their corresponding frequency and phase modulation techniques.			

Module 18

Code	**Course/Module Title**	**ECTS**	**Semester**
COE223	Physics	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
It aims to provide students with a solid foundation in the basic principles and concepts of electrical and electronic physics. It covers topics such as electric fields, magnetic fields, electromagnetic waves, and semiconductor physics. The aim is to ensure that students have a clear understanding of the basic principles that govern electrical and electronic phenomena.			

Module 19

Code	**Course/Module Title**	**ECTS**	**Semester**
COE224	Operating systems	6	
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			

The aim of this Operating system Lecture is:

1. To introduce students to the fundamental concepts and principles of operating systems.
2. To familiarize students with the key components and functionalities of operating systems.
3. To develop students' understanding of operating system design principles and management techniques.
4. To equip students with practical skills in implementing, managing, and troubleshooting operating systems.
5. To foster critical thinking and problem-solving abilities in the context of operating system-related challenges.

Module 20

Code	Course/Module Title	ECTS	Semester
COE225	Electronic	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			
This module aims to introduce students to the fundamentals of electronics, with a focus on the principles of semiconductor physics, diodes and transistors, diode equivalent circuits, DC analysis, AC to DC rectifiers, clipper and clamper circuits, and BJT and FET transistor equivalent circuits. It further aims to educate students on transistor amplifiers, power amplifiers, operational amplifiers, and integrated circuits, including oscillators.			

Module 21

Code	Course/Module Title	ECTS	Semester
COE226	Job Ethics	3	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
يهدف المقرر الى تعريف طلبة بأخلاقيات المهنة حسب تخصصهم التقني ، واكسابهم القواعد الاخلاقية المهنية التي تعزز التزامهم بها ، في مجال عملهم المتوقع بعد التخرج			

Module 22

Code	Course/Module Title	ECTS	Semester
COE311	English Language	3	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43

Description
The aim of this English Language Lecture is to provide students with a comprehensive understanding of the English language, including its structure, usage, and various linguistic aspects. The lecture aims to enhance students' language skills and improve their overall proficiency in English.

Module 23

Code	Course/Module Title	ECTS	Semester
COE312	Engineering analysis	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			
1. The course curriculum aims to introduce the student to the skills of scientific mathematical foundations, qualify him with basic information, and teach him solutions to engineering problems using multiple numerical and engineering methods. 2. The student understands mathematical theories and laws that enable the student to apply them in the fields of engineering, whether in engineering analyzes or other applications. 3. The course also aims to teach students solutions to ordinary and partial differential equations, their applications, Fourier series, Laplace transformations, numerical methods, linear interpolation, numerical integration, and solutions to nonlinear equations.			

Module 24

Code	Course/Module Title	ECTS	Semester
COE313	Control engineering fundamental	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	76
Description			
This course is an introductory course on linear control systems. It introduces the fundamentals and concepts of modeling and control of linear time invariant systems			

Module 25

Code	Course/Module Title	ECTS	Semester
COE314	Real time systems	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			

The aim of this module is to provide students with a comprehensive understanding of real-time systems design, including their definitions, types, operational mechanisms, and related components. Through this module, students will gain insight into both analog and digital systems, their signal properties, and the conversion between them. They will also learn about basic interfacing devices and techniques to control data transfer in real-time systems.

Module 26

Code	Course/Module Title	ECTS	Semester
COE315	Signal processing	7	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	51
Description			
1. To describe signals mathematically and understand how to perform mathematical operations on signals. 2. It will provide knowledge of Digital filter. 3. To discuss word length issues, multi rate signal processing and application. 4. Understand and classify digital signal processing systems. 5. Understanding how to convert an analogue signal into digital. 6. Understand the pulse and frequency analysis of intermittent signals. 7. Designing digital filters and studying their response.			

Module 27

Code	Course/Module Title	ECTS	Semester
COE321	Digital communications	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			
1. Understand and classify digital communication technologies 2. Clarifying the basic concept of digital communication system circuits through a set of tools 3. Enhancing students' analytical abilities and problem-solving 4. Preparing students for extensive knowledge of digital inclusion systems 5. Enable students to perform this knowledge in the field of computer technology			

Module 28

Code	Course/Module Title	ECTS	Semester
COE322	Microcontrollers	8	6

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	4	124	76
Description			
This module aims to provide students with a comprehensive understanding of microcontrollers and Programmable Logic Controllers (PLCs). It will explore the architecture, programming, and application of microcontrollers, with a special focus on PIC microcontrollers. Furthermore, the module introduces the principles, input-output modules, number systems, logic fundamentals, and programming aspects of PLCs. Students will gain hands-on experience in PLC wiring diagrams, ladder logic programs, and the application of sensors and actuators in industrial settings.			

Module 29

Code	Course/Module Title	ECTS	Semester
COE323	Computer networks	8	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	124	76
Description			
1. To develop problem solving skills and understanding of circuit theory through the application of techniques. 2. To understand voltage, current and power from a given circuit. 3. This course deals with the basic concept of electrical circuits. 4. This is the basic subject for all electrical and electronic circuits. 5. To understand Kirchhoff's current and voltage Laws problems. 6. To perform mesh and Nodal analysis.			

Module 30

Code	Course/Module Title	ECTS	Semester
COE324	Networks simulators	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	64	36
Description			
This module aims to provide students with an in-depth understanding of network simulation. The course covers various aspects including simulator and emulator differences, advantages and limitations of network simulation, and simulation techniques. It introduces networking basics, terminologies, and common topologies. The course also delves into network architectures, protocols, and the OSI model. Furthermore, students will learn about different network elements, implementation strategies, IP addressing, network management, and troubleshooting techniques.			

Module 31

Code	Course/Module Title	ECTS	Semester
COE325	Cyber security	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	64	36
Description			
1. Understanding the fundamental concepts of cybersecurity. 2. Identifying common cybersecurity threats and vulnerabilities, such as malware, phishing, and social engineering. 3. Learning about different types of cyber-attacks and how they can be prevented or mitigated. 4. Understanding the importance of risk management and incident response in cybersecurity.			

Module 32

Code	Course/Module Title	ECTS	Semester
COE411	English Language	3	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	0	32	43
Description			
The aim of this English Language Lecture is to provide students with a comprehensive understanding of the English language, including its structure, usage, and various linguistic aspects. The lecture aims to enhance students' language skills and improve their overall proficiency in English.			

Module 33

Code	Course/Module Title	ECTS	Semester
COE412	Smart Systems Modeling	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			
• Biological inspiration for artificial neural networks (ANNs), neurons, synapses, axons, dendrites ,action potentials, Hebbian learning. • Underpinning data structures, including directed graphs, nodes (artificial neurons), edges, weights, layers (input, output, hidden), thresholds, propagation functions, learning rules, topologies, activation functions. • Problem domains such as classification, pattern recognition, data mining, medical diagnosis and gaming. Alternative neural network architectures: feedforward, radial basis function network, Hopfield,			

Boltzmann machines, recurrent, spiking neural networks.
- Supervised/unsupervised learning approaches.
- Approaches to validation: training/testing sets, k-folds cross validation, leave-one-out cross validation.

Module 34

Code	Course/Module Title	ECTS	Semester
COE413	Multimedia Computing	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			
This module aims to: 1. Provide an understanding of the fundamental concepts and components of multimedia computing. 2. Teach students about different multimedia applications, multimedia research topics, and multimedia on the web. 3. Expose students to different multimedia data basics such as graphics, image data representation, audio, and video basics. 4. Teach techniques and methods for multimedia data compression and transmission over networks.			

Module 35

Code	Course/Module Title	ECTS	Semester
COE414	Networks Protocols	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			
1. To develop knowledge about the network reference models OSI and TCP/IP. 2. To understand the used Protocols in each network layer. 3. How the network model completes its work by using the protocols? 4. The Fundamental concepts of the protocol. 5. To understand each used protocol and its details. 6. Deal with networking strategies.			

Module 36

Code	Course/Module Title	ECTS	Semester
COE415	Computer graphics	6	7

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	2	94	56
Description			

Module 37

Code	Course/Module Title	ECTS	Semester
COE416	Graduation Project P	3	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	2	45	30
Description			

Module 38

Code	Course/Module Title	ECTS	Semester
COE421	Information Theory	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	31
Description			
This module aims to: 1. Provide a foundational understanding of information theory and its application in digital communication systems. 2. Provide students with knowledge of the theoretical limits and practical methods for data compression and error correction. 3. Teach students about information sources, entropy, and the various properties of information channels. 4. Enable students to understand and apply concepts like source coding, channel coding, and data compression techniques.			

Module 39

Code	Course/Module Title	ECTS	Semester
COE422	Computer Security	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56

Description
1. To understand the classic and modern encryption, decryption algorithms 2. To develop knowledge about the security of OSI and TCP/IP. 3. To understand many types of encryption, decryption algorithms. 4. How the to protect network completes while it works? 5. The Fundamental concepts security for computer and network. 6. To understand each used algorithm and its details. 7. Deal with classic and modern encryption, decryption algorithms.

Module 40

Code	Course/Module Title	ECTS	Semester
COE423	Mobile Communications	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	94	56
Description			

Module 41

Code	Course/Module Title	ECTS	Semester
COE424	Projects Managements	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	64	36
Description			

The student will understand:

- Define different aspects of project management
- Clarify the general concept in the way of managing the exception
- Determine the usefulness of using computers in project management
- Presentation of the example project

Module 42

Code	Course/Module Title	ECTS	Semester
COE425	Wireless communications	6	8

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	2	94	56
Description			

Module 43

Code	Course/Module Title	ECTS	Semester
COE426	Graduation project T	3	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	2	45	30
Description			

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