Ninevah University
جامعة نينوى

First Cycle – Bachelor's Degree (B.Sc.) – Computer and Information Engineering
بكالوريوس - هندسة حاسوب ومعلوماتية

Table of Contents

1. Overview

This catalogue is about the courses (modules) given by the program of Computer and Information Engineering 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 هندسة الحاسوب والمعلوماتية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (٤٨) مادة دراسية، على سبيل المثال، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
NVEECI111	Computer Programming I	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	88	62
Description			
C programming, levels of programming languages, Computer components, variables, constants, flowchart, Pseudo-code, libraries, headers, case sensitivity, keywords, syntax, error, identifiers, format specifier, Sequencing, condition, iteration, printf, scanf, arithmetic operators, logical operators, bitwise operators, relational operators, instructions priorities, if statement, switch case, Loop, for statement, while statement, do-while statement.			

Module 2

Code	Course/Module Title	ECTS	Semester
NVEE206	Mathematics I	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	72	78
Description			
Basics of Linear Algebra, Transpose of a Matrix, Rank of a Matrix, Special Matrices, Systems of Linear Algebraic equations, Elementary Row Operations and Elimination methods, Elimination methods, Linear Independence/Dependence, Matrix Inverse, Solving Systems of Linear Equations using Matrix Inverse, Trivial and Non-trivial solutions, Determinants, Cramer's rule, Eigen Values and Eigen Vectors, Differentiation, Tangents and the Derivative at a Point, Differentiation Rules, Derivatives of Trigonometric Functions, The Chain Rule and Higher Order Derivatives, Implicit Differentiation, Concavity (Maxima and minima), Curve sketching, Indeterminate Forms and L'Hôpital's rule, Transcendental functions, Exponential functions, Logarithmic function to an arbitrary base, Natural logarithm functions, Inverse trigonometric functions, Hyperbolic functions, Inverse hyperbolic functions, Differentiation of Exponential, Logarithmic function to an arbitrary base, and Natural logarithm functions, Differentiation of Inverse trigonometric functions, Hyperbolic and Inverse Hyperbolic functions, Vectors, Representation of vectors in 2D and in space, Vector functions, Partial derivatives, Directional derivative, Gradient, Del operator, Divergence and Curl.			

Module 3

Code	Course/Module Title	ECTS	Semester
NVEE215	DC Circuit Analysis	6	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	88	62
Description			
Current and voltage definitions, and circuit elements. Combining resistive elements in series, parallel, and Delta-Star Transformation. Voltage and current division. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction. Mesh and nodal analysis, Source transformation Thevenin and Norton theorem. Inductor and Capacitor as Circuit Elements, RL and RC Circuits, Transient response			

Module 4

Code	Course/Module Title	ECTS	Semester
NVEE218	Physical Electronics	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	88	37
Description			
Transport phenomena in semiconductor, Intrinsic semiconductor, extrinsic semiconductor, doping, n-type semiconductor, p-type semiconductor, mass action low, conductivity, electrical properties in intrinsic and extrinsic semiconductors, PN junction, junction diode characteristics, PN junction bias, volt-ampere characteristics of diode, diode circuit analysis, types of diode, varactor diode, schottky diode, tunnel diode, zener diode, diode applications, diode as rectifier, full wave and half wave rectifier, center tapped full wave rectifier, bridge full wave rectifier, diode clipping, positive clipper, negative clipper, diode clamping circuits, negative clamper and positive clamper, diode logic gates AND and OR gates, transistor characteristics, bipolar junction transistor (BJT), BJT types, basic transistor operation (current and voltage analysis), single biased source, transistor logic gates NAND and NOR gates.			

Module 5

Code	Course/Module Title	ECTS	Semester
NV12	Democracy and Human Rights	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	30	20
Description			
فكره النظام السياسي، شرعية النظم السياسية، أنواع النظم السياسية، في النظام الديمقراطي، مقدمة تأصيلية، تعريف الديمقراطية، أركان ومرتكزات النظام الديمقراطي، نماذج الديمقراطية، الديمقراطية المباشرة، الديمقراطية غير المباشرة، الديمقراطية شبة المباشرة، كيف يتم التحول إلى الديمقراطية، الديمقراطية ونظم إدارة الدولة، النظام المركزي، النظام اللامركزي، إشكاليات النظام الديمقراطي، موقف الإسلام من الديمقراطية، الخطاب الإسلامي التقليدي، الخطاب الاسلامي المعاصر			

Module 6

Code	Course/Module Title	ECTS	Semester
NVEECI112	Information Technology	5	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
Introduction to a computer system – Information technology and computer definitions, computer system characteristics with specific features and functions of cases, power supplies, internal components, internal cables, ports and cables, input devices, output devices, computer classification, and historical developments of computers. Operating system definition and the role of the operating system, characteristics of the operating system, what are the minimum hardware requirements of different Microsoft operating systems, define the file system, explain different file system characteristics. Fundamental concepts of network definition, components and types of computer networks, purpose and characteristics of the network, network standard wired and wireless standards, physical components of a network, cables, connectors, and mode of transmission, internet protocol addressing. Fundamental of laptops and portable devices, laptop power configuration, laptops hardware and component configuration, mobile device hardware overview			

Module 7

Code	Course/Module Title	ECTS	Semester
NVEECI112	Computer Programming II	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	88	62
Description			
C programming, standard libraries, user-defined library functions, function definition, function prototyping, function call, passing arguments, function parameters, recursive function, arrays (1D and 2D), elements, indexing, global variables, local variables, functions with arrays, string, 1D array of strings, 2D array of strings, string functions, pointer, file I/O, program structure.			

Module 8

Code	Course/Module Title	ECTS	Semester
NVEE207	Mathematics II	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	72	78
Description			
Integration: The Fundamental Theorem of Calculus, The Definite Integral, The Indefinite Integral, Integration of Transcendental functions, Algebraic Substitutions, Trigonometric substitutions, Partial Fractions, Integration by Partial Fraction Expansion, Integration by parts, Further substitutions, Arc length, surface area, etc, The Polar Coordinates system, Polar equations, Graphs of Polar equations, Sequences and Series "the basics", Special Series, Series – Convergence/Divergence, Integral Test, Comparison Test / Limit Comparison Test, Alternating Series Test, Absolute Convergence, Ratio Test, Root Test, Power Series, Power Series and Functions, Taylor/Maclaurin series			

Module 9

Code	Course/Module Title	ECTS	Semester
NVEE216	AC Circuit Analysis	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	88	62
Description			
AC circuits – RMS and average value, complex numbers in AC, AC in Rc, and RL. Phaser diagram, voltage, and current divider, series and parallel AC circuits, mesh, and nodal AC circuits analysis. Thevenin's equivalent in AC circuits, Frequency response and resonance of a series RLC circuit, power factor.			

Module 10

Code	Course/Module Title	ECTS	Semester
NVEE217	Digital Techniques	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	88	62
Description			
Decimal number system; Binary; Octal and hexadecimal number systems; Conversion from one to another number system; Addition; Subtraction; Multiplication and division using different number systems; Representation of binary number insignia-magnitude; Sign 1's and align 2's complements notation; Rules for addition and subtraction with complement Representation; BCD; ASCII; Parity bit; Gray code; AND; OR; NOT; NAND; NOR; Ex-OR logic gates; Boolean algebra; De-Murrage's laws; Simplification of Boolean expressions; Canonical and standard forms for Boolean function; SOP and POS forms; Realization of Boolean functions using NAND and NOR gates only; Design using available logic gates; Objectives of the minimization procedures; Karnaugh map method; Don't care conditions; Half and full adder; Half and full subtractor; Parity bit generator and checker; Code converters; Binary multiplier; magnitude comparator; Binary parallel adder; BCD adder; Encoder; Priority encoder; Decoder; Multiplexer and DeMultiplexer circuits; Implementation of Boolean functions using decoder and Multiplexer; BCD to 7-segment decoder.			

Module 11

Code	Course/Module Title	ECTS	Semester
NVEE201	Engineering Drawing	4	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	42
Description			
Introduction to CAD, Introduction to AutoCAD, Basics of Drawing or drafting (2D) in AutoCAD, 2D-Modify Commands, Annotation and Layers, Basics of 3D in AutoCAD-Part 1, Basics of 3D in AutoCAD-Part 2, Glance to AutoCAD Electrical			

Module 12

Code	Course/Module Title	ECTS	Semester
NV11	English	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	30	20
Description			
This section includes a description of the module, 100-150 words			

Module 13

Code	Course/Module Title	ECTS	Semester
NVEECI211	Object Oriented Programming	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	37
Description			
Overview of C and C++, Pointers, String.h and math.h, Files, Object Oriented Programming Overview and Classes, Inline Functions, Constructor and Destructors, Friend Functions, Functions Overloading, Array of Objects, C++'s Dynamic Allocation Operators, Inheritance			

Module 14

Code	Course/Module Title	ECTS	Semester
NVEE208	Engineering Analysis I	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	78	47
Description			
Multiple Integrals, Double Integrals in Cartesian coordinates, Double Integrals in Polar coordinates, Triple Integrals Cartesian, Cylindrical coordinates, Triple Integrals spherical coordinates, Introduction to differential equations, Initial value problem, Differential equations as a mathematical mode, First order DEs., separable equations, exact equations, Linear equations, Solution by substitution, Linear Models, Graphing solutions to First order DEs, Higher Order differential equations, theory of linear equations (Homogeneous and non-homogeneous equations), Homogeneous equations with constant coefficients, Undetermined coefficients, Variations of parameters, Cauchy Euler equation.			

Module 15

Code	Course/Module Title	ECTS	Semester
NVEECI212	Digital Design I	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47
Description			
Minimization Methods: Five Variables K-Map, Tabular method (Quine-Mcklusky), and Map Entered variables. Introduction to VHDL and implement a combinational Logic Circuit. SSI, and MSI to Implement and design the Boolean functions. Use PLD (ROM, PLA, and PAL). And solve Hazard.			

Module 16

Code	Course/Module Title	ECTS	Semester
NVEE210	Signals & Systems I	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47
Description			
Basic Definitions, Signal and system characteristics, and models, Continuous- Time Signals and systems, Time domain analysis of Continuous-Time signals, Frequency-domain representation of the continuous-time signals, Frequency-domain analysis of Continuous- Time systems			

Module 17

Code	Course/Module Title	ECTS	Semester
NVEE224	Electronics	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	93	32
Description			
Introduction to transistor circuits: Different DC circuit biasing for CB, CE &CC; Small signal analysis and design: small signal equivalent circuit for CB; CB Input/Output resistance; calculation of current and voltage gain; CE and CC configuration Input/Output resistance; calculation of current and voltage gain; DC Load line; Operating point; Ac load line; Graphical Analysis for voltage gain; Two port networks; Hybrid parameters to analyze transistor circuits; Darlington Pair analysis and it's equivalent circuit; Frequency response: Definition and Concepts; Gain in decibel; The effect of the Coupling capacitor. Low cut- off frequency analysis due to the R- C Coupled amplifier in BJTs; High frequency behavior of CB; High cut- off frequency; Gain Band- Width products. FET and MOS transistor: Introduction to the theory and operations of FFT Transistor; configurations, FET Transistors transfer characteristics. Transistor biasing circuit, Small signal analysis of FET transistor. Common source circuit. Common gate and Common Drain circuit. Construction of MOS FET: Depletion and Enhancement type characteristics; small signal analysis. MOSFET Amplification Circuits.			

Module 18

Code	Course/Module Title	ECTS	Semester
NVEE222	Communication Principles	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	72	53
Description			
Transmissions Lines Equations; Transmission Bandwidth Concept; Distortion less Transmission Conditions; Types of Transmission Media. Amplitude Modulation; DSB; SSB; VSB Transmission; Amplitude Modulators; Balanced Modulator; Envelope Detectors. Angle Modulation; Spectrum Calculation for Sinusoidal Waveform; Phase Modulation; Relationship Between FM and PM; NBFM and WBFM; Frequency Modulators (Armstrong method)			

Module 19

Code	Course/Module Title	ECTS	Semester
NV13	The Crimes of the Baath Regime in Iraq	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	30	20
Description			

Module 20

Code	Course/Module Title	ECTS	Semester
NVEECI221	Data Structures	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	37
Description			
Basic data types and data structures, Program analysis and program classification, Accessing an element in the memory, Stacks; general concepts and applications, Queues; general concepts and applications, Linked lists; dynamic and static, trees and graphs, Searching and sorting algorithms, Storage allocation, Garbage collection and compaction, Logical and physical organization of files, File processing and management.			

Module 21

Code	Course/Module Title	ECTS	Semester
NVEE209	Engineering Analysis II	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	78	47
Description			
Series Solutions of Linear differential equations, Solutions about ordinary points, Solutions about singular points, Special functions (Bessel function and Legendre function), Probability, Definitions, experiments and sample spaces, Events, axioms of probability, Mutually exclusive & conditional probability, Permutations & combinations, Discrete sample spaces, Contiguous Sample spaces, The total probability theorem, Bayes' Rule, Binomial and Poisson distributions, Normal distribution, Discrete Random Variable, Probability mass function (PMF), Cumulative distribution function (CDF), Continuous random variables, Probability density function (PDF), Statistics, Mean or expected value of a function, Standard deviation and variance, Partial differential equations, Partial differential equations, Partial differential equations, Complex Analysis, Complex Analysis			

Module 22

Code	Course/Module Title	ECTS	Semester
NVEECI222	Digital Design II	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47
Description			
Sequential Logic Circuits: Circuit Delay Model, Characteristic Equation, Present State / Next State, State Diagram, K- Map, ASM chart. Gated SR Latch. Flip Flop Types, Truth Table, Excitation Table, Introduction to Moore, Mealy, Mixed types. Analyzing and Design the Synchronous Moore, Mealy Machine. Analyzing and Design the Synchronous Mealy Machine. Implication table. Counters and Shift Registers. Asynchronous Sequential Circuit of Fundamental and Pulse Modes.			

Module 23

Code	Course/Module Title	ECTS	Semester
NVEECI223	Microprocessor Programming	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	60	37
Description			
Introduction to microprocessor. Data Representations. Introduction to microprocessor. Data Representations. 8086 Architecture and 8086 Addressing Modes. Data Transfer instructions. Logical Instructions. Arithmetic instructions. Shift and rotate instructions. Program control and Subroutine instructions. Fixed Point Arithmetic. Interrupt instructions. Two Dimensional Arrays. Sorting Algorithms. Assembly language programing, DOS and BOIS Interrupts & Software Applications			

Module 24

Code	Course/Module Title	ECTS	Semester
NVEE210	Signals & Systems II	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	47
Description			
Basic Definitions, Signal and system characteristics, and models, Continuous- Time Signals and systems, Time domain analysis of Continuous-Time signals, Frequency-domain representation of the continuous-time signals, Frequency-domain analysis of Continuous- Time systems			

Module 25

Code	Course/Module Title	ECTS	Semester
NVEECI224	Digital IC Design	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	62	63
Description			
Introduction to Operational Amplifier, Non- inverting, summer , difference OP- Amp circuits, Lin, exp, integrator, differentiators, and instrumentation Op- Amp circuits, Introduction to filtering, and passive filter circuits, Active filter circuits, and Sallen, and high- order filtering circuit, A/D and D/A circuit analysis, DTL, and RTL circuits analysis and design, TTL circuits analysis and design, ECL analysis and design, Advance MOSFET circuits analysis and design, CMOS circuits analysis and design, Memory circuits design, FPGA design, 555 timer circuits studding			

Module 26

Code	Course/Module Title	ECTS	Semester
NV14	Arabic	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	30	20
Description			

Module 27

Code	Course/Module Title	ECTS	Semester
NVEECI311	Computer Architecture I	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	67
Description			
Computer abstraction and technology, Register transfer and computer design basics, Instruction set architecture (ISA) –Basic computer operation cycle, operand addressing, addressing modes, instruction types, Computer arithmetic – integer arithmetic, floating point arithmetic, Design of Single cycle datapath, Multicycle datapath, Pipelined datapath, Performance analysis of single cycle, multicycle and pipelined datapath, Pipeline hazard			

Module 28

Code	Course/Module Title	ECTS	Semester
NVEECI312	Computer Networks I	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
Introduction to the computer network, network model (LAN, MAN, WAN), Network topology, and transmission media. Data link layer, Data Link Control (DLC), and Media Access Control (MAC). Ethernet. Introduction to the Network layer, IP address, subnetting, and IP forwarding			

Module 29

Code	Course/Module Title	ECTS	Semester
NVEECI313	Operating Systems	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	67
Description			
What is an Operating System and how the Operating Systems Work, Operating System Services and Operating System Software- Resource Management, Evolution of Operating Systems and Computing Environments, Process Concept , Process States and Process Control Block (PCB), Scheduling Queues, Operations on Processes and Context Switch, Cooperating & Independent Processes and Inter Process Communication, CPU and I/O Burst Cycle and Different Types of Process Schedulers, Preemptive and No- Preemptive Scheduling, Scheduling Criteria and Different types of process scheduling algorithms, Introduction to Threads, Applications for Multithreading, Benefits of Multithreading, Multicore Programming and Concurrency and Parallelism, Serial Computing VS Parallel Computing, Types of Parallelism , User Threads and Kernel Threads and Hyper- Threading Technology & Multicore CPU, the Process Synchronization and Critical- Section Problem, Solutions to Critical- Section Problem, Introduction to Deadlock Problem, Methods for Handling Deadlocks			

Module 30

Code	Course/Module Title	ECTS	Semester
NVEECI314	Microprocessor Applications	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
Review of 8086. 8086 System Connections and Timing. input/output interfacing. Memory Interfacing. Digital To Analog Converter Interfacing. Analog To Digital Converter Interfacing. Memory test. Programmable peripheral Interface 82C55 programming and Interfacing. Implementation of Digital filter. Stepper Motor Interfacing. Microprocessor System Design Applications.			

Module 31

Code	Course/Module Title	ECTS	Semester
NVEECI315	Digital Signal Processing I	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
Introduction to Digital Filter, Filter specifications and design methods, Digital Filter Design: FIR filters, Windowing techniques, Realization of FIR digital filter: transversal form and linear phase form, Filter implementation considerations, Frequency sampling design method, Digital Filter Design: IIR filters, Filter implementation considerations, Butterworth, Chebyshev, and elliptic filter design, Impulse-invariant design method, POLE- ZERO placement method, Realization of IIR digital filter: Direct form and cascade structures, Audio processing applications, Speech analysis, synthesis, ECG analysis			

Module 32

Code	Course/Module Title	ECTS	Semester
NVEECI316	Digital Communications	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
The differences between digital and analog sources and systems and the advantages and disadvantages of digital communications are explored. Signal types and sampling theory are also introduced. Equations and waveforms in the time domain are studied, along with generation and detection circuits. The required channel bandwidth for various modulation techniques such as PAM, PTM, PWM, and PPM is discussed. Time-division multiplexing (TDM) for sampled signals is covered, and a tutorial is provided. Pulse code modulation (PCM) is explored, including equations, waveforms, generation, and detection circuits. Signal-to-noise ratio (S/N) and required channel bandwidth are also addressed. Compression-expansion techniques and line coding for baseband signals are introduced, along with TDM-PCM. Delta modulation (DM) is studied, including equations, waveforms, generation, and detection circuits. Signal-to-noise ratio, required channel bandwidth, and adaptive delta modulation (ADM) are covered. Power spectral density (PSD) and the probability of error for baseband signals are introduced. Finally focus on different digital carrier modulation techniques, such as ASK, FSK, PSK, QPSK, DPSK, and QAM. Equations, waveforms, generation and detection circuits, constellation diagrams, power spectral density, required channel bandwidth, and probability of error are discussed for each technique.			

Module 33

Code	Course/Module Title	ECTS	Semester
NVEECI321	Computer Architecture II	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	67
Description			
Review of Datapath and control design – Pipelined datapath, Data Hazards: Forwarding versus Stalling, Control Hazards, Branch prediction, Instruction level parallelism, superscalar, out-of-order processor, Introduction to memory hierarchy, Memory Technologies, Basics of Caches, Cache organizations, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, Introduction to Parallel architecture, SISD, MIMD, SIMD, SPMD, and Vector, Multicore and Other Shared Memory Multiprocessors			

Module 34

Code	Course/Module Title	ECTS	Semester
NVEECI322	Computer Networks II	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
IPv4, IPv6, VLAN, Wireless LAN. Spanning Tree protocol. The routing protocol (Distance vector, Link state, RIP, OSPF, and BGP4). Introduction to Transport Layer. Transport Layer protocol (UDP and TCP). Cloud Networking, Internet of Things (IoT).			

Module 35

Code	Course/Module Title	ECTS	Semester
NVEE202	Industrial Management and Professional Ethics	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	44	56
Description			
General concept , Owner ship, decision making, Systems concept and value analysis, Production system and product design and development, Production system and product design and development, Product quality control, Material management purchase management purchase and inventory, Marketing management, Human resource management, Financial management, Industrial safety. اخلاقيات المهنة: مقدمة, مفهوم اخلاقيات المهنة، اهمية العمل الضمير, نظام العمل، الاخلاق التي لها صلة مباشرة باخلاقيات المهنة، اخلاقيات مهنة المهندس، تاريخ المدونات الهندسية، كوارث هندسية، مدونة حمورابي، مدونة ابت، مناقشة مدونة ابت، مدونة جمعية المهندسين العراقية، مناقشة مدونة جمعية المهندسين العراقية، مناقشة عامة			

Module 36

Code	Course/Module Title	ECTS	Semester
NVEECI323	Microcomputers and Microprocessors	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	60	65
Description			
Introduction to microcomputer. Timer 82C54 Interfacing and programing. UART 82C50 Interfacing and programing. PIC 82C59 Interfacing and programing. Keyboard-display controller 82C79 interfacing and programing. Keyboard-display controller 82C79 interfacing and programing. 80386 microprocessor Architecture and software model. Input-output interface 80386. Memory Interface to 80386. 80386 new instructions of 80386. Protected mode programming of 80386. Virtual memory management of 80386			

Module 37

Code	Course/Module Title	ECTS	Semester
NVEECI325	Digital Signal Processing II	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
Introduction to Digital Filter, Filter specifications and design methods, Digital Filter Design: FIR filters, Windowing techniques, Realization of FIR digital filter: transversal form and linear phase form, Filter implementation considerations, Frequency sampling design method, Digital Filter Design: IIR filters, Filter implementation considerations, Butterworth, Chebyshev, and elliptic filter design, Impulse-invariant design method, POLE- ZERO placement method, Realization of IIR digital filter: Direct form and cascade structures, Audio processing applications, Speech analysis, synthesis, ECG analysis			

Module 38

Code	Course/Module Title	ECTS	Semester
NVEECI326	Information Theory and Cryptography	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	74	76
Description			
Information Theory and Source Coding: Probability Basics, Probability Distributions, Information Measure, Entropy, Mutual Information, Relative Entropy, Differential Entropy, Information Coding, Shannon Source Coding Theorem, Optimal Coding: Huffman codes Huffman Code for Encoding Pairs of Symbols, Data compression, Shannon-Fano-Elias Coding, Arithmetic Coding, The Lempel-Ziv Algorithm, Run Length Encoding, Channel Capacity and Coding: Channel Entropy, Channel Capacity, Shannon Coding Theorem, Gaussian Channel and SHT, Linear Block Codes for Error Correction, Cyclic			

codes, Cyclic Redundancy Check (CRC) Codes, Bose–Chaudhuri Hocquenghem (BCH) Codes Cryptography: Symmetric (Secret Key) Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), RC Ciphers, Advanced Encryption Standard (AES), Asymmetric (Public-Key) Algorithms, The RSA Algorithm, One-way Hashing

Module 39

Code	Course/Module Title	ECTS	Semester
NVEE211	Design of Graduation Project	2	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	-	30	20
Description			
Collaborative team work of the nature in a research environment is expected, including extensive interaction with other students. Each student should submit a written technical report and should attend the final oral examination. The students apply verbal written and oral technical skills to document the design process.			

Module 40

Code	Course/Module Title	ECTS	Semester
NVEECI411	Digital Image Processing	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	88	62
Description			
Introduction, Image Processing Fundamentals, Image Processing Fundamentals, Image Enhancement (Point Processing), Image Enhancement (Histogram Processing), Spatial Filtering, Frequency Filtering, Image restoration, Wavelets and Multiresolution Processing, Segmentation			

Module 41

Code	Course/Module Title	ECTS	Semester
NVEECI412	Information Systems	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	67
Description			
Introduction to Information Systems, Information Systems in Organizations. Hardware and Mobile Devices, Software and mobile Applications, Database Systems and Big Data, and Networks and Cloud Computing. Electronic and Mobile Commerce. Transaction processing system (TPS), Decision			

Supporting systems (DSS). System Acquisition and Development. Information System Security, waste and mistakes in an Information Systems

Module 42

Code	Course/Module Title	ECTS	Semester
NVEECI413	Network Programming	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	88	62
Description			
Python Basics ,Variables, data types, and operators , Control structures, Input and output operations, function parameters, Data Structures in Python, Modular Programming and File Handling, Key components and architecture of IoT systems, IoT Devices and Sensors, Programming languages and frameworks for IoT, IoT Application Development			

Module 43

Code	Course/Module Title	ECTS	Semester
NVEECI414	Real Time Systems	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	88	62
Description			
Introduction to real- time systems, Resistive, Capacitive and inductive sensors, Pyro- piezo materials and modern sensors, Signal conditioners, Computer buses, Introduction to Microcontroller, Microcontroller programming part, Real- time storage, Real- time systems design consideration, Real-time operating systems			

Module 44

Code	Course/Module Title	ECTS	Semester
NVEECI415	Software Engineering	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	67
Description			
Software engineering systems, software engineering ethics, software process models, process activities, specifications and requirements, design and implementation, testing and validation, process improvement, agile software development methods, software evolution, software maintenance, dependability, availability, reliability, safety, security, resilience, reliability engineering, reliability requirements, dependable Systems, fault-tolerant architectures, reliability measurement, project management, risk management, teamwork."			

Module 45

Code	Course/Module Title	ECTS	Semester
NVEE212	Implementation of Graduation Project	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	58	42
Description			
Collaborative team work of the nature in a research environment is expected, including extensive interaction with other students. Each student should submit a written technical report and should attend the final oral examination. The students apply verbal written and oral technical skills to document the design process.			

Module 46

Code	Course/Module Title	ECTS	Semester
NVEECI421	Computer Graphics	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
Introduction, Hardware Basics, Graphics Standards and Primitives, Raster Algorithms (Digital Differential Analyzers), Raster Algorithms (Bresenham Algorithm), Drawing Circles, Area filling, Clipping, Approaches to Geometric Modeling, Transformations, Visible Surface Algorithms			

Module 47

Code	Course/Module Title	ECTS	Semester
NVEECI422	Database management	4	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	44	56
Description			
Introduction to Database and Database Management System. Data Types, Database Keys, SQL Functions and Operators, Overview of Database Constraints. Relational databases, SQL. Physical Data Storage. Transaction Management, and Database Access. Data warehousing and business intelligence. Data integration, data quality and data governance, Big data, Analytics."			

Module 48

Code	Course/Module Title	ECTS	Semester
NVEECI423	Embedded Systems	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	51
Description			
Introduction to embedded systems, Embedded systems programming, Embedded systems power and code optimization, CPU scheduling algorithms, Embedded systems scheduling algorithms, Multi-processor scheduling algorithms, Embedded systems design issues, Priority inversion, Priority inversion solution protocols			

Module 49

Code	Course/Module Title	ECTS	Semester
NVEECI424	Digital Control Systems	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	4	88	62
Description			
Transfer Function of physical systems, mathematical modeling, graphical representation. Time Response Analysis , first and second order systems . Stability of linear control systems. Root Locus Technique. Steady state errors of unity feedback systems. Frequency Response Analysis and Design by adjusting gain using bode plot. PID Controller Analysis and Design based on Root Locus and tuning of PID Controller parameters using Zeigler-Nichols Methods. Digital Control System, Pulse Transfer Function, Sampled - Data systems, Closed-Loop systems with Digital Computer, Stability of Digital Control Systems, Sampling period Selection and Implementation of Digital PID Controller using Numerical Integration.			

Module 50

Code	Course/Module Title	ECTS	Semester
NVEECI425	Artificial Intelligence	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	72	78
Description			
Artificial Intelligent (AI), machine learning (ML), deep learning (DL), artificial neural network (ANN), activation functions, classification, regression, clustering, learning methods, supervised learning, unsupervised learning, reinforcement learning, model overfitting, model underfitting, Gradient descent, bias, variance, Naïve Bayes classifier, genetic algorithms, traveling salesman problem (TCP), route-finding searching algorithms, fuzzy logic, pattern recognition, face detection, face recognition. "			

Contact

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