Al-Balqa' Applied University

Curriculum for the Bachelor Degree in Computer Engineering

The curriculum for the B.S.c. degree in ***Computer Engineering*** (160) credit hours are distributed as follows:-

No.	Requirements	Credit Hours
1	University Requirements • Compulsory • Elective	 21 6
2	Faculty Requirements	27
3	Specialization Requirements • Compulsory • Elective	 88 6
4	Supportive Specialization Requirements	12
Total		**160**

Curriculum for the Bachelor Degree in Computer Engineering

First : University Requirement (27 Cr .H.)

A: Compulsory Requirements (21 Cr.H.):

Course No.	Course Title	Cr.H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
35003101	Arabic (1)	3	3	--	--
35003102	Arabic (2)	3	3	--	35003101
35004101	English (1)	3	3	--	--
35004102	English (2)	3	3	--	35004101
35005101	Computer Skills (1)	3	--	6	--
35001101	Military Sciences	3	3	--	--
35002100	National Education	3	3	--	

B: Elective University Requirements : (6 Cr.H.)

The student is allowed to select (6 Cr.H.) from the university elective courses offered by faculties other than the faculty of college.

Course No.	Course Title	Cr.H
36001101	Communication skills	3
36002102	Introduction to Psychology	3
36003103	Jordanian Society	3
36004104	Sport for All	3
36005105	Islamic Culture	3
36006106	Administration and Economic Concepts	3
36007107	Agriculture in Jordan	3
36008108	Environment and Society	3
36012109	The Orthodox Caliphs History	3

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Second: Faculty Requirements: (27 Cr .H.)

Course No.	Course Title	Cr.H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
30202101	Calculus 1	3	3	-	-
30202102	Calculus 2	3	3	-	30202101
30201101	Physics 1	3	3	-	-
30201111	Physics Lab. 1	1	-	3	30201101*
30201102	Physics 2	3	3	-	30201101
30201112	Physics Lab. 2	1	-	3	30201102*
30206101	General Chemistry 1	3	3		
30129101	Engineering Workshops	1	-	3	-
30129203	Engineering Drawing	2		6	35005101
30206111	General Chemistry lab	1	-	3	30206101*
30129201	Static	3	3	-	30202102, 30201101
30801101	Computer Skills 2	3	2	3	35005101

* Prerequisite or Co-requisite

Third: Specialization Requirements: (94 Cr. H.)

A- Compulsory Requirements (88 Cr. H.)

Course No.	Course	Cr. H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
30104211	Electrical Circuits 1	3	3	-	30201102
30104212	Electrical Circuits 2	3	3	-	30104211
30104214	Electrical Circuits Lab.	1	-	3	30104212*
30104241	Electronics 1	3	3	-	30104212*
30104342	Electronics 2	3	3	-	30104241
30104344	Electronics Lab.	1	-	3	30104241
30102330	Digital Electronics	3	3	-	30104241
30102212	Digital Logic Design	3	3	-	30102251*
30102213	Digital Logic Design Lab.	1	-	3	30102212
30102214	Computer Organization & Design	3	3	-	30102212
30102315	Computer Architecture	3	3	-	30102214
30102316	Computer Org. & Architecture Lab.	1	-	3	30102315*
30102414	Computer Networks	3	3	-	30104345*
30102415	Computer Networks Lab.	1	-	3	30102414
30102317	Microprocessor Systems	3	3	-	30102315

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Course No.	Course	Cr. H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
30102418	Microprocessor Systems Lab.	1	-	3	30102317
30102411	Embedded Systems	3	3	-	30102317
30102412	Embedded Systems Lab.	1	-	3	30102411
30102321	Object-Oriented Programming	3	3	-	30801101
30102325	Data Structures	3	3	-	30102321
30102326	Design and Analysis of Algorithms	3	3	-	30102325*
30102424	Data Structures & Algorithms Lab.	1	-	3	30102325
30102324	Operating Systems	3	3	-	30102315
30102421	Database Systems	3	3	-	30102325
30102422	Database Systems Lab.	1	-	3	30102421
30107341	Signals & Systems	3	3	-	30104241*
30104213	Electromagnetics	3	3	-	30201102
30102345	Principles of Communications	3	3	-	30107341
30102441	Optimal Control Systems	3	3	-	30107341
30102442	Optimal Control Systems Lab.	1	-	3	30102441*
30102416	Computers and Networks Systems Security	3	3	-	30102414
30102425	Machine Learning	3	3	-	30102326
30102413	Field Training	6	-	-	100 Cr. Hrs.
30102518	Project 1	3	-	-	120 Cr. Hrs.
30102519	Project 2	3	-	-	30102518

B- Specialization Elective Requirements: (6 Cr. H.) to be selected from the following list:

Course No.	Course	Cr. H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
30102511	Performance Evaluation & Modeling	3	3	-	30102315
30102512	Special Topics in Computer Engineering	3	3	-	To be determined by Dept.
30102521	Fuzzy Logic	3	3	-	30102425
30102513	Computer Interfacing	3	3	-	30102411
30102544	Digital Signal Processing	3	3	-	30107341
30102555	Parallel Processing Systems	3	3	-	30102315

* or Co requisite

Curriculum for the Bachelor Degree in Computer Engineering

Fourth: Supportive Specialization Requirements: (12 Cr.H):

Course No.	Course	Cr. H.	Weekly Hours		Prerequisite
			Lecture	Lab.	
30104353	Probability and Random Variables	3	3	-	30202102
30102251	Discrete Structures	3	3	-	-
30202204	Engineering Mathematics 1	3	3	-	30202102
30202205	Engineering Mathematics 2	3	3	-	30202204

Curriculum for the Bachelor Degree in Computer Engineering

First Year					
First Semester			**Second Semester**		
Course No.	**Course Title**	**Cr. Hrs.**	**Course No.**	**Course Title**	**Cr. Hrs.**
35005101	Computer Skills1	3	35003102	Arabic Language 2	3
35003101	Arabic Language 1	3	35004101	English Language 2	3
35004101	English Language 1	3	30202102	Calculus 2	3
30202101	Calculus 1	3	30201102	Physics 2	3
30201101	Physics1	3	30201112	Physics Lab 2	1
30201111	Physics Lab1	1	30206101	Chemistry 1	3
30129231	Engineering Drawing	2	30206111	Chemistry Lab. 1	1
			30129131	Engineering Workshops	1
Total		**18**	**Total**		**18**

Second Year					
First Semester			**Second Semester**		
Course No.	**Course Title**	**Cr. Hrs.**	**Course No.**	**Course Title**	**Cr. Hrs.**
30102251	Discrete Structures	3	30801101	Computer Skills 2	3
30102212	Digital Logic Design	3	30202205	Engineering Mathematics 2	3
30104211	Electrical Circuits 1	3	30104212	Electrical Circuits 2	3
30104353	Probability and Random Variables	3	30104214	Electrical Circuits Lab.	1
30104213	Electromagnetic	3	30104241	Electronics 2	3
30202204	Engineering Mathematics 1	3	30102214	Computer Organization & Design	3
			30102213	Digital Logic Design Lab	1
Total		**18**	**Total**		**17**

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Third Year					
First Semester			**Second Semester**		
Course No.	**Course Title**	**Cr. Hrs.**	**Course No.**	**Course Title**	**Cr. Hrs.**
30104342	Electronics 2	3	30102317	Microprocessor Systems	3
30104344	Electronics Lab.	1	30102324	Operating Systems	3
30102315	Computer Architecture	3	30102326	Design and Analysis of Algorithms	3
30107341	Signals & Systems	3	30102330	Digital Electronics	3
30102316	Computer Org. & Architecture Lab.	1	30102325	Data Structures	3
30102321	Object-Oriented Programming	3	30104345	Principles of Communications	3
30146210	Statics	3			
Total		**17**	**Total**		**18**

Fourth Year					
First Semester			**Second Semester**		
Course No.	**Course Title**	**Cr. Hrs.**	**Course No.**	**Course Title**	**Cr. Hrs.**
30102414	Computer Networks	3	30102416	Computers and Networks Systems Security	3
30102421	Database Systems	3	30102422	Database Systems Lab.	1
30102441	Optimal Control Systems	3	35001101	Military Science	3
30102411	Embedded Systems	3	30102412	Embedded Systems Lab.	1
30102418	Microprocessor Systems Lab.	1	30102425	Machine Learning	3
35002100	National Education	3	30102413	Field Training	6
30102424	Data Structures & Algorithms Lab.	1	30102515	Computer Networks Lab.	1
30102442	Optimal Control Systems Lab.	1			
Total		**18**	**Total**		**18**

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Fifth Year					
First Semester			**Second Semester**		
Course No.	**Course Title**	**Cr. Hrs.**	**Course No.**	**Course Title**	**Cr. Hrs.**
30102518	Project 1	3	30102519	Project 2	3
	University Elective	3		University Elective	3
	Specialization Elective	3		Specialization Elective	3
Total		**9**	**Total**		**9**

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

35003101 Arabic Language 1 3(3-0)

This course contains a set of linguistic skills in different levels such as the sounds of the Arabic language, its morphology, syntax, rhetoric, lexicography and writing. It includes as well as on applications on the use of Arabic dictionaries and applications on some writing skills indispensable for scholars in their working lives. It also contains a refined set of Quranic, poetry and short stories of Arabic texts to give the learners the opportunity to be in contact with and to appreciate these texts.

Pre-req. Arabic 99 or passing Arabic Level Exam

35003102 Arabic Language 2 3(3-0)

This course aims to develop student's skills in writing and expression and to provide him with the necessary and basic ones in order to employ them in his daily use, and enable him to stand on the origins of various Arabic scripts, and access to various forms of technical and functional old and new writing.

Pre-req. 35003101

35004101 English 1 3(3-0)

Is a complete graded course for foreign learners of English; it covers the skills of listening, speaking, reading, and writing; as well as improving pronunciation and building vocabulary; particular emphasis is placed on listening and speaking; the language of the course is British English.

Pre-req. English 99 or passing English Level Exam

35004102 English 2 3(3-0)

Is a continuation of English I Course in terms of approach and methodology However, it covers a new range of interesting topics, and provides a more advanced grammar syllabus in a communicative context as well, therefore, this topic tends to be a continuation of ENGL 101 goals.

Pre-req. 35004101

35005101 Computer Skills 1 3(0-6)

An introduction to computing and the broad field of information technology. Topics covered include the basic structure of digital computer systems; operating systems; application software; data communication and networks; and the Internet hands-on learning emphasizes windows (latest operating systems); MS-Office; and the Internet.

35001101 Military Science 3(3-0)

This course aims at providing university students with general military culture and illustrating the overall military capabilities of the armed forces to defend the homeland and its role in development and service of the Jordanian society through lectures and field visits.

35002100 National Education 3(3-0)

The course of National Education is one of the compulsory requirements of all students in Jordanian universities, national and private. The general intent is to provide students with the theoretical and practical knowledge of the homeland (Jordan), land and people, and to consolidate the love of the homeland and national brotherhood in them, to motivate them to serve the nation and the people consciously and sincerely, to be innovative and competitive by exhortations to achieve the desired progress in various fields of life.

30202101 Calculus 1 3(3-0)

Review: functions, limits and continuity, the derivative integration, definite integral, indefinite integral, fundamental theorem of calculus, mean value theorem for integral area, volume of solid revolution, arc length, and surface area.

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30202102 Calculus 2 3(3-0)

Exponential, logarithmic, and inverse trigonometric functions hyperbolic functions, differentiations, integration, and limits of these function, principles of integral evaluation integration by parts, trigonometric substitution, partial fraction radical expression, infinite series, theorems in convergence and divergence, analytic geometry in calculus.(polar coordinate functions).

Pre-req. 30202101

30201101 Physics 1 3(3-0)

Physics and measurements; vectors; motions in one dimension; motion in a plane; laws of motion; circular motion; Newton's laws and applications; work and energy; law of gravity; linear momentum and collisions; rotation of a rigid object about a fixed axis; rolling motion; angular momentum and torque.

30201102 Physics 2 3(3-0)

Electric charge and Coulomb's law; Electric fields and Gauss law; electric potential; potential energy, capacitors and dielectrics; DC and resistance; direct current circuits; magnetic fields; sources of magnetic field; Faraday's law; inductance; alternating current circuits; electromagnetic waves.

Pre- req. 30201101

30201111 Physics Lab 1 1(0-3)

Measurement and errors; vectors; rectilinear motion; projectile motion; Newton's second law; friction; collisions; circular motion; rotational motion; simple harmonic motion.

Co-req. 30201101

30201112 Physics Lab 2 1(0-3)

Electric field mapping; Ohm's construction law; Wheatstone bridge; electric power; potentiometer; Kerchief's laws; charging and discharging circuits (R-C circuits); magnetic torque on a loop; Faraday's laws of magnetic induction; resonance in R-L-C circuits.

Co-req. 30201102

30146210 Statics 3(3-0)

Basic definitions and concepts Statics of particles; rigid bodies; equivalent systems of forces; centurions and centers of gravity; analysis of structures: frames, machines, and trusses; friction; moments of inertia; computer-aided statics.

Pre-req. 30202102, 30201101

30801101 Computer Skills 2 3 (2-3)

Computer programming languages and their implementation; including; writing flow charts, the basic C++ programming variable definitions, templates, branches, loops, functions, arrays, strings, pointers, files, introduction to object-oriented programming, applications.

Pre req. 35005101

30206101 Chemistry 1 3 (3-0)

Periodic table; atomic stricture and chemical bonds; electron configuration; chemical stoichiometry; Redo-system; chemical equilibrium; thermodynamic; chemical kinetics; electro-chemistry

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30206111 Chemistry Lab 1 1 (0-3)

Basic concepts, atomic theory and periodic table. Chemical bonding and molecular structure. Chemical reactions in solutions, oxidation-reduction reactions, ideal gases, states of matter and intermolecular forces. Physical properties of solutions and colloids. Chemical equilibrium, solubility, molecular structure, types of chemical reactions. Thermodynamics principles and kinetics. Organic chemistry.

Co-req. 30206101

30129131 Engineering Workshops 1(0-3)

Mechanical works including: hand filing, turning, welding, metal cutting, casting and molding, electrical circuits; elements of electrical circuits; open and closed circuits; AC/DC circuits; instruments and measurements. Carpentry works including: types of timber, timber works, equipment and tools.

30129231 Engineering Drawing 2(0-6)

Use of instruments; lettering; graphic geometry; orthographic; isometric drawing and sketching; environmental applications; Introduction to AutoCAD, application of AutoCAD, commands, geometric entities. Geometric construction. Dimensioning, free –hand sketching, object representation, orthographic drawing and projections.

Pre-req. 35005101

30104211 Electrical Circuits 1 3(3-0)

Introduction. Current, Voltage, Resistance, Ohm's low, Power and energy, Series, parallel and Series-Parallel resistive circuits, Current and Voltage Sources, Superposition, Thevenin's, Norton's theorems, Kerchov mesh current and node voltage methods. Capacitance and inductance, R-C and R-L-C circuits, frequency response, Complex numbers in reactive circuits, resonance and filters.
Single-phase & three-phase circuits connections and analysis; two-port networks; troubleshooting in DC and AC circuits.

Pre-req. 30201102

30104212 Electrical Circuits 2 3(3-0)

Sinusoidal forcing function. Phasor concepts. The sinusoidal steady state response. Average power and RMS values. Poly-phase circuits: Single phase, three phase (Y) and (Δ) connection. Complex Frequency, Frequency Response Analysis, Magnetically coupled circuits and two-port networks.

Pre-req. 30104211

30104214 Electrical Circuits Lab.1 1(0-3)

DC circuits: Ohm's law; KVL and KCL; network theorems; transient analysis of RL; RC; and RLC circuits; impedance concept and techniques; power and P.F; series and parallel resonance; three phase circuits; parameters of two-port networks; magnetically coupled circuits; filters; troubleshooting.

Co-req. 30104212

30104241 Electronics 1 3(3-0)

Properties of semiconductor materials; doping technique; p-n junction; diode: forward and reverse biasing; VI static characteristics; small and large-signal models; junction capacitance and switching times; types and applications; bipolar junction transistors: construction; connections and biasing; applications; small signal models; ratings; and applications; field-effect transistors: construction types; VI characteristics; ratings; and applications.

Co-req. 30104212

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30104342 Electronics 2 3(3-0)

Operational amplifiers: basic theory, characteristics and applications. Differential and multistage amplifiers. Frequency response of single and multistage amplifiers. Negative feedback analysis: feedback topology, Properties and stability analysis.

Pre-req. 30104241

30104344 Electronics Lab. 1 1(0-3)

Diode characteristics; rectification; regulation; clipping and clamping; BJT characteristic and applications; FET characteristics and applications; frequency response of amplifiers; DC regulated power supplies; troubleshooting projects.

Pre-req. 30104241

30102330 Digital Electronics 3(3-0)

Electronic devices. Diodes and transistors. BJT gates. RTL basic gates. RTL buffer. DTL basic gate. TTL Structure: operation, I/O characteristics, power dissipation, low power TTL, High-speed TTL, open-collector TTL, and Shottkey TTL. Main features of basic ECL gates. MOS gates. NMOS inverter and gates. CMOS inverter and gates. CMOS tri-state gates. Bilateral switches. Comparison and interfacing of logic families. Semiconductor ROM and RAM. A/D and D/A conversion. Timing circuits. Mono-stable and stable multi-vibrators. IC multi-vibrators.

Pre-req. 30104241

30102212 Digital Logic Design 3(3-0)

Binary Systems and Digital Components, Boolean Algebra and Logic Gates, Gate-Level Minimization, Combinational Logic, Synchronous Sequential Logic, Registers and Counters, Memory and Programmable Logic, Register Transfer Level.

Co-req. 30102251

30102213 Digital Logic Design Lab. 1(0-3)

Building combinational circuits using gates. Parallel adder. Decoders and Multiplexers. ROM and RAM. Registers and counters.

Pre-req. 30102212

30102214 Computer Organization & Design 3(3-0)

Inner workings of modern digital computer systems and tradeoffs at the hardware-software interface. Topics include: instructions set design, memory systems, input-output systems, interrupts and exceptions, pipelining, performance and cost analysis, assembly language programming, and a survey of advanced architectures.

Pre-req. 30102212

30102315 Computer Architecture 3(3-0)

Analysis, synthesis and evaluation of different computer architectures. Emphasis on computer design with respect to price/performance and its relation to architectural choices such as pipelining, memory hierarchy, input/output, instruction set design, vector processing, and multiprocessing.

Pre-req. 30102214

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30102316 Computer Org. and Architecture Lab. 1(0-3)

Introductory experiments to build and test simple digital combinational and sequential circuits using TTL integrated circuits. More advanced experiments to design and implement, possibly using CAD tools, parts of a computer includine ALU, register, eemory, and control circuit. A simple computeb design project tsing CPUL or VHDL.

Co-req. 30102315

30102414 Computer Networks 3(3-0)

Data communications and OSI Model. Open system standard. Circuit switching and packet switching. The physical layer and the electrical interface. Transmission media types. Attenuation and distortion sources. Noise signal delay and bandwidth. Data transmission. Error detection and control. LAN topologies and types. The Internet. Bridges and repeaters. Routers and switches. Introduction to WAN and internet. The X-25protocol. TCP/IP suite and applications.

Co-req. 30102345

30102415 Computer Networks Lab. 1(0-3)

Experimentation with internetworking protocols, routers, bridges, and firewalls, and other hardware and software network components. And mainly focuses on switching and simple router configurations with CLI and structuring cabling system.

Pre- req. 30102414

30102317 Microprocessor Systems 3(3-0)

Organization: registers; memory; microprocessors; and I/O ports; binary and hexadecimal arithmetic; assembler instructions; processor status (flags); program control; the program stack; integer multiplication and division; arrays and addressing modes; using an integrated programming and debugging environment for assembly language; assembler language programming on a PC. String instructions; text display and keyboard programming; macros; memory management (interfacing with a high level language and 32-bit assembler programming); BIOS and DOS interrupts (timers; device drivers); recursion; floating point arithmetic; disk and file operations; machine language translation; and structure of assembler translators

Pre-req. 30102315

30102418 Microprocessor Systems Lab. 1(0-3)

Using the microprocessor kit; arithmetic instruction call and return instructions; conditional and unconditional jump; look up tables; software interrupts; hardware interrupts; I/O ports; 6840 Programmable Timer Module (PTM); course project; compiling; running and debugging; jumping and looping; strings; procedures; macros; riles; interrupts.

Pre-req. 30102317

30102411 Embedded Systems 3(3-0)

This course introduces trends and design strategies for embedded systems. It covers the design and use of single and general-purpose processors. Emphasis will be placed on hardware and software co-design, design representation, control and interface circuits for embedded systems. The course also introduces system-on-chip concept and design issues such as testability and power considerations.

Pre-req. 30102317

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30102412 Embedded Systems Lab. 1(0-3)

Introduction to embedded systems design tools and hardware programmers. Experiments using both simulation and practical implementation of the basic building blocks of a microcontroller including timers, counters, PWM generation, I/O techniques and requirements, A/D conversion, serial communications. Experiments to explore the system design process using hardware-software co design process. Design project.

Pre-req. 30102411

30102321 Object-Oriented Programming 3(3-0)

To learn the fundamental concepts and techniques behind object-oriented programming in C++. They include: abstract data types (classes, objects, and methods); creation, initialization, and destruction of objects; class hierarchies and inheritance; polymorphism and dynamic binding. In addition, generic programming using templates and algorithm abstraction will also be discussed.

Pre-req. 30801101

30102325 Data Structures 3(3-0)

Asymptotic notations. Performance measurement. Sorting and searching: algorithms and lower bound. Abstract data types and classes. Data structures: stacks, queues, lists, trees, heaps, and search trees, tries, and hashing. Graphs: representation, depth-first-search, and breadth-first-search.

Pre-req. 30102321

30102326 Design and Analysis of Algorithms 3(3-0)

Techniques for designing algorithms, proving their correctness, and analyzing their running times and space complexities. Topics covered include: sorting, selection, heaps, balanced search trees, divide-and-conquer, greedy algorithms, dynamic programming, and graph algorithms: searching and backtracking, connectivity, bi-connectivity, minimum spanning tree, shortest path. NP-completeness.

Co-req. 30102325

30102424 Data Structures & Algorithms Lab. 1(0-3)

Implementations for the topics covered in Data Structures and Algorithms course.

Pre-req. 30102325

30102324 Operating Systems 3(3-0)

Operating-system structures, process management, CPU scheduling, process synchronization, deadlocks, memory management (paged and segmentation), virtual memory, I/O systems, secondary storage structure, disk scheduling, distributed systems, designing and building various operating systems components.

Pre-req. 30102315

30102421 Database Systems 3(3-0)

This course introduces basic concepts and implementation techniques in database management systems: disk and memory management; advanced access methods; implementation of relational operators; query processing and optimization; concurrency control and recovery.

Pre-req. 30102325

30102422 Database Systems Lab. 1(0-3)

This Lab. practices the concepts introduced in the Database systems course using Oracle Database. The students are expected to implement a database project for some problem.

Pre-req. 30102421

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30107341 Signals and Systems 3(3-0)

Signal and system model and classification. Continuous time signals. Signals and vectors. Generalized Fourier series representation. Amplitude and phase spectra of signals. Energy and power content of signals. Bandwidth of signals. The Fourier Transform and applications. Sampling of signals. Convolution of signals. Power and Energy spectral densities. Time-domain analysis of continuous time systems. The system impulse response. Filters: LPF and HPF. Unit sample response and response to arbitrary input sequences.

Co-req. 30104241

30104213 Electromagnetic 3(3-0)

Electric charge, Coulomb's law, static electric field, electric potential, electric flux, Gauss's law, divergence theorem, electric conductor, dielectric media, permittivity, electric field boundary conditions, capacitance, electrostatic energy and forces, steady electric current, electromotive force, Kirchhoff's voltage law and Kirchhoff's current law; Static magnetic field, Amber's law of force, Biot-Savart law, Ampere's circuital law, curl of the magnetic field, Stokes' theorem, vector magnetic potential, magnetic flux, magnetic fields in media, permeability, magnetic field boundary conditions, magnetic forces and the Hall effect.

Pre-req. 30201102

30102345 Principles of Communications 3(3-0)

Continuous-wave modulation (CW). Amplitude Modulation (AM). Angle modulation. Frequency and phase modulation (FM, PM). Bandwidth estimation in CW-modulation. AM and FM receivers. Noise in CW Modulation. Noise Sources. Interference and noise representation. Signal to noise ratio (SNR). Pulse modulation. Time division multiplexing (TDM). Pulse code Modulation (PCM). Delta modulation, DPCM. Baseband transmission: Pulse shaping and line coding. Nyquists criterion for distortion-less transmission. Digital transmission techniques: Binary ASK, FSK and PSK. Performance of digital modulation schemes in the presence of noise.

Pre-req. 30107341

30102441 Optimal Control Systems 3(3-0)

Introduction to feedback control systems. Basic elements and benefits of computer-controlled systems. Emphasizing state space techniques. Basic principles, modeling, analysis, stability, structural properties, optimization, and design to meet specifications. Industrial applications on optimal control.

Pre-req. 30107341

30102442 Optimal Control Systems Lab. 1(0-3)

This lab aims at implementing the basic concepts covered in Optimal Control Systems course.

Co-req. 30102441

30102416 Computers and Networks Systems Security 3(3-0)

The course covers security principles of computer networks systems. It discusses various attack techniques and how to defend against them. Topics include network attacks and defenses, operating system holes, web security, e-mail, botnet, malware, social engineering attacks, privacy, and digital rights management. The course includes a project for building reliable code and understanding attacks.

Pre-requisites: 30102414

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30102425 Machine Learning 3(3-0)

Fundamentals of machine learning. Concept learning. Evaluating hypotheses. Supervised learning, unsupervised learning and reinforcement learning. Bayesian learning. Ensemble Methods such as Genetic Algorithm, Decision Tree, Naïve Bayes, k-Nearest Neighbors, Back Propagation neural networks and their applications in computer engineering.

Pre-req. 30102326

30102511 Performance Evaluation & Modeling 3(3-0)

Introduction to floating-point arithmetic and error analysis. Fundamentals of computer design. Technology trends. Performance metrics. Performance evaluation. Measurement techniques and tools. Workload characterization. Data presentation. Statistical methods for analyzing measured data. The quantitative approach: experimental design and analysis. Model types. Hardware Description Languages. Event-driven simulation. Introduction to queuing theory and modeling. Modeling and simulation packages and tools.

Pre-req. 30102315

30102512 Special Topics in Computer Engineering 3(3-0)

The objective of this course is to introduce advanced and new topics in one of the areas of computer engineering. The topics can be changed from one year to another depending on the instructor's areas of specialty.

Pre-req. To be set by the Dept.

30102521 Fuzzy Logic 3(3-0)

Introduction to the fundamental concepts of fuzzy systems. Fuzzy sets, t-norms and s-norms, fuzzy relations, approximate reasoning, structure analysis of fuzzy systems, construction of fuzzy systems from data, Introduction to neurofuzzy systems. Implementation of fuzzy concepts to computer engineering applications (fuzzy control system).

Pre-req. 30102425

30102513 Computer Interfacing 3(3-0)

Introduction to I/O organization of a typical computer, Computer peripheral interfacing (input and output devices). Micro computer ports: Serial, Parallel, Mouse. I/O multi processing interfacing, Inter processor communication schemes, Human computer interface. Virtual reality: Interface for real application, Wireless interfacing, Optical computing devices, Intelligent interface machines.

Pre-req. 30102411

30102544 Digital Signal Processing 3(3-0)

Discrete-time signals and systems; discrete Fourier transform and related discrete time orthogonal transform, and related fast algorithm; IIR and FIR filter design techniques, and realizations; multi-rate digital signal processing; response of linear systems to random processes. Home works and term project are designed so that the students can apply theory learnt in the class to physical problems. MATLAB CAD tools are being used as an integral part of this course.

Pre-req. 30107341

Curriculum for the Bachelor Degree in Computer Engineering
Course Description

30102555	**Parallel Processing Systems**	**3(3-0)**

Parallelism in processors; multi-core processors; classification of parallel architectures; multiprocessor architectures; interconnections networks; abstract parallel machine models; templates for parallel algorithms; searching, merging, sorting; graph algorithms (traversing, spanning trees, connected components); numerical algorithms (matrix algorithms, linear equations), Data dependencies; shared memory computing (threads, OpenMP); message passing computing; parallelization strategies (embarrassingly parallel, partitioning, pipelined, synchronous); load balance. Students are expected to program parallel concepts by C++ and some other specialized libraries/tools.

Pre-req. 30102315

30104353	**Probability and Random Variables**	**3(3-0)**

Introduction to probability and Random Variables. Discrete random variable. Continuous random variable. The probability density function. The probability distribution function. Statistics of random variable. Random process, Ergodicity and stationary. Auto correlation function. Power spectral density. Estimating the autocorrelation function and power spectral density from raw data. Input output relations of linear systems.

Pre-req. 30202102

30102251	**Discrete Structures**	**3(3-0)**

Basic concepts in discrete mathematics needed for the study of computer: enumeration techniques, basic number theory, logic and proofs, recursion and recurrences, probability theory and graph theory. The approach of this course is specifically computer application oriented

30202204	**Engineering Mathematics 1**	**3(3-0)**

Engineering mathematics Basic concepts and ideas, Separable equations, Exact equations, Linear and Bernoulli equations, Homogeneous equations with constant coefficients, Complex, Euler-Cauchy equation, Wronskian, Non-homogeneous equations, Undetermined coefficients, Variation of parameters, Higher order differential equations, Higher order non-homogeneous equations, Vectors and Matrices, Homogeneous systems, Power series method, Theory of power series, Frobenius method, Laplace transform, Transformation of derivatives and integrals, Unit step function, Differentiation and integration of transforms, Convolution, Partial fractions.

Pre-req. 30202102

30202205	**Engineering Mathematics 2**	**3(3-0)**

Vector calculus. Line and surface integrals. The three main theorems: Green theorem, Stokes theorem and divergence theorem. Fourier series, integrals and transforms. Partial differential equations solutions using Fourier series and transforms

Pre-req. 30202204

30102413	**Field Training**	**6**

Three credit hours are equivalent to (140) hours of field training.

Pre-req. 100 Cr. Hrs.

30102518	**Project 1**	**3**

Pass 120 Cr. Hrs.

30102519	**Project 2**

Pre-Req. 30102518