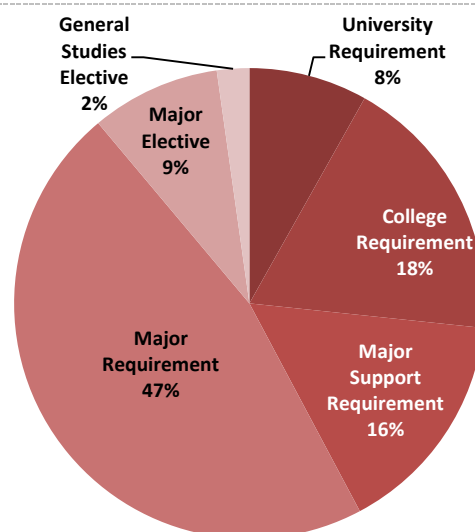


B.Sc. in Computer Engineering 2014

Program Components

Course Type	CRD
University Requirement (UR)	11
College Requirement (CR)	24
Major Support Requirement (MSR)	21
Major Requirement (MR)	63
Major Elective (ME) ¹	12
General Studies Elective (GSE) ²	3
CR- Training (Internship) Yes	1
Total Credit (CRD)	135



¹ Student must select four courses from Major Elective(ME) List.

² Student must select one General Studies Elective from Humanities and Social Science.

Note:

- Humanities and Social Science Component: Any course from the following:
 Humanities: Fine Arts, History, American Studies, Classics, Communications, English, (Foreign Language) French, Music, Philosophy, Theatre, Literature (Arabic), Religion (comparative).
 Social Science: Anthropology, Economics, Education, Geography, History, Psychology, Sociology, Women's Studies, Political Science.

Detailed Study Plan

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 101	General Chemistry I	3	3	4	MSR	-----	No
ITCS 111	Computer Programming I	3	2	3	CR	-----	Yes
ENGL 154	Language Development I	3	0	3	CR	-----	No
MATHS 101	Calculus I	3	0	3	CR	-----	No
PHYCS 101	General Physics I	3	3	4	MSR	-----	No

Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	---	No
ENGL 155	Language Development II	3	0	3	CR	ENGL 154	No
PHYCS 102	General Physics II	3	3	4	MSR	PHYCS 101	No
MATHS 102	Calculus II	3	0	3	MSR	MATHS 101	No
ITCS 112	Computer Programming II	3	2	3	CR	ITCS 103 or ITCS 111	Yes

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
HRLC 107	Human Rights	2	0	2	UR	-----	No
ITCE 260	Circuit Analysis	3	2	3	MR	PHYCS 102 & MATHS 102	Yes
ITCE 250	Digital Logic	3	2	3	MR	ITCS 111	Yes
ITCS 216	Data Structures and Algorithms	3	2	3	CR	ITCS 112	Yes
MATHS 205	Differential Equations	3	0	3	MSR	MATHS 102	No
MATHS 342	Linear Algebra and Complex Analysis	3	0	3	MSR	MATHS 102	No

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ENGL 219	Technical Report Writing	3	0	3	CR	ENGL 155	No
ITCE 263	Electronic Circuits I	3	2	3	MR	ITCE 260	Yes
ITCE 272	Signals and Systems	3	2	3	MR	ITCE 260 & MATHS 205	Yes
ITCE 251	Digital Design	3	3	4	MR	ITCE 250	Yes
STAT 273	Probability and Statistic	3	0	3	CR	MATHS 101	No

Year 3 - Semester 5

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ARAB 110	Arabic Language Skills	3	0	3	UR	-----	No
ITCS 252	Discrete Structures I	3	2	3	MR	ITCS 111 & MATHS 101	Yes
ITCE 314	Computer Networks I	3	2	3	MR	(ITCS 112 or ITCS 114) & (STAT 273 or STAT 271) *	Yes
ITCE 341	Introduction to Microprocessors	3	3	4	MR	ITCE 250	Yes
ITCE 363	Electronic Circuits II	3	2	3	MR	ITCE 263 & ITCE 250	Yes

STAT 271* for college of Science students only/ ITCS 114 for CS students.

Year 3 - Semester 6

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCE 300	Digital Communications	3	2	3	MR	STAT 273 & ITCE 272	Yes
ITCE 362	Computer Architecture I	3	2	3	MR	ITCE 341	Yes
ITCE 320	Network Programming	2	3	3	MR	ITCS 216 & ITCE 314	Yes
ITCS 323	Operating Systems	3	2	3	MR	ITCS 216 & ITCE 341	Yes
ITCE 380	Applied Numerical Analysis	3	2	3	MR	ITCS 111 & MATHS 205	Yes
ISLM 101	Islamic Culture	3	0	3	UR	-----	No

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCE 482	Industrial Training	0	3	1	CR-Training	Pass 85 Credits	Yes

Year 4 - Semester 7

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCE 471	Digital Signal Processing	3	2	3	MR	ITCE 272	Yes
ITCE 470	Control Systems	3	2	3	MR	ITCE 272	Yes
ITCE 499	Senior Project	0	6	3	MR	ENGL 219 & pass 85 credits	Yes
ITCE 444	Microprocessors Based Design	3	3	4	MR	ITCE 341 & ITCE 363	Yes
ITCE 4XX	ITCE Elective 1	3	2	3	ME	As per ME list	Yes

Year 4 - Semester 8

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCE 416	Computer Networks II	3	2	3	MR	ITCE 314	Yes
ITCE 4XX	ITCE Elective 2	3	2	3	ME	As per ME list	Yes
ITCE 4XX	ITCE Elective 3	3	2	3	ME	As per ME list	Yes
ITCE 4XX	ITCE Elective 4	3	2	3	ME	As per ME list	Yes
GSE XXX	Humanities / Social Sciences	3	0	3	GSE	-----	No
ITCE 498	Generic Skills and Professional Issues	3	0	3	MR	ENGL 219	Yes

Major Elective Courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCE 417	Mobile and Wireless Networking	3	2	3	ME	ITCE 314	Yes
ITCE 418	Network Engineering and Design	3	2	3	ME	ITCE 314 or ITCE 352	Yes
ITCE 419	Wireless Sensor Networks	3	2	3	ME	ITCE 314	Yes
ITCE 420	Virtual Private Networks	3	2	3	ME	ITCE 314	Yes
ITCE 422	Computer Architecture II	3	2	3	ME	ITCE 362	Yes
ITCE 431	Computer and Network Security	3	2	3	ME	ITCE 314	Yes
ITCE 425	Parallel and Distributed Systems	3	2	3	ME	ITCE 314	Yes
ITCE 436	Multimedia Communications	3	2	3	ME	ITCE 300	Yes
ITCE 440	GPS Based Systems	3	2	3	ME	ITCE 314	Yes
ITCE 446	Computer Peripherals and Interfacing	3	2	3	ME	ITCE 341	Yes
ITCE 452	Digital System Design	3	2	3	ME	ITCE 251	Yes
ITCE 455	VLSI Design	3	2	3	ME	ITCE 251 & ITCE 363	Yes
ITCE 464	Intelligent Systems	3	2	3	ME	ITCE 470	Yes
ITCE 466	Industrial Electronics	3	2	3	ME	ITCE 363	Yes
ITCE 474	Digital Control Systems	3	2	3	ME	ITCE 470	Yes
ITCE 484	Robotics	3	2	3	ME	ITCE 341 & ITCE 363	Yes
ITCE 488	Biomedical Computer Applications	3	2	3	ME	ITCE 300 & ITCE 341	Yes
ITCE 493	Selected Topics in Computer Engineering	3	2	3	ME	Department Approval	Yes

General Studies Elective Courses List

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		Lec	Prac	CRD		
ARAB 141	Modern Arabic Lit.	3	0	3	GSE	-----
ARAB 242	Arabic Poetry In The Renaissance Period	3	0	3	GSE	-----
ART 133	Fundamentals of Music and Its Appreciation	3	0	3	GSE	-----
ART 141	Drawing and Painting	2	1	3	GSE	-----
ART 221	Traditional Music of Bahrain and Its Application	3	0	3	GSE	-----
CHL 101	Introduction to Chinese Language	3	0	3	GSE	-----
EDAR 126	Playing on Piano and Org 1	3	0	3	GSE	-----
EDPS 144	Psychology of Learning and Memory	3	0	3	GSE	-----
EDTC 100	Teaching and Learning Technology	3	0	3	GSE	-----
ENGL 130	Introduction to Literature	3	0	3	GSE	-----
FREN 141	French I	3	0	3	GSE	-----
GERM 101	Introduction to German	3	0	3	GSE	-----
HISTO 212	Contemporary History of The Arab World	3	0	3	GSE	-----
HISTO 281	Landmarks of Islamic Civilisation	3	0	3	GSE	-----
ISLM 114	Quranic Sciences	3	0	3	GSE	-----
ISLM 136	Biography of The Prophet	3	0	3	GSE	-----
ISLM 141	Introduction to Shari'a	3	0	3	GSE	-----
ISLM 252	Islamic Doctrine	3	0	3	GSE	-----
JAPN 101	Japanese Level I	3	0	3	GSE	-----
KL 101	Korean Language	3	0	3	GSE	-----
TL 101	Turkish Language	3	0	3	GSE	-----
LAW 101	Introduction to Legal Studies	3	0	3	GSE	-----
LAW 102	History of Law	3	0	3	GSE	-----
LAW 106	Constitutional Law I	3	0	3	GSE	-----
PSYC 103	Introduction to Psychology	3	0	3	GSE	-----
PSYC 120	Psychology of Marriage	3	0	3	GSE	-----
PSYC 211	Educational Psychology	3	0	3	GSE	-----
SOCIO 161	Introduction to Sociology	3	0	3	GSE	-----
SOCIO 181	Introduction to Anthropology	3	0	3	GSE	-----

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		Lec	Prac	CRD		
SOCIO 191	Citizenship, Identity and Globalization	3	0	3	GSE	-----
SOCIO 224	Sociology of Health	3	0	3	GSE	-----
SOCIO 226	Sociology of Arabian Gulf	3	0	3	GSE	-----
GSE XXX	Other electives	X	X	3	GSE	Department Approval

Course Description

Course Code: ITCE 250

Course Title: Digital Logic

Number systems (number system conversion; modulo-N arithmetic; coding techniques). Combinational logic circuits (Boolean algebra; logic minimization; standard forms of Boolean expressions; Karnaugh maps). Combinational Network Design (NAND and NOR implementation; Multiple output networks). MSI Integrated circuits in Combinational networks design (Adders; decoders; encoders; multiplexers; comparators; ROMs; PALs; PLAs). Sequential circuits analysis and design (latches; flip flops; analysis and design of synchronous sequential networks; counters; registers).

Course Code: ITCE 260

Course Title: Circuit Analysis

Systems of units, charge, current, voltage, power and energy, Ohm's & Kirchoff's laws. Series, parallel and Wye-Delta transformation Independent and dependent sources, mesh & nodal analysis Superposition, Thevenin's & Norton's theorems, Transient analysis of RC & RL circuits, Sinusoids & phasors, impedance & admittance, AC mesh & nodal analysis, AC power analysis.

Course Code: ITCE 251

Course Title: Digital Design

Digital system design utilizing state machines (Mealy and Moore models; state minimization and assignment). Synchronous sequential network implementation with MSI circuits and PLDs (Counters; ROMs; PALs; FPGAs). Asynchronous sequential circuits analysis and design. Algorithm State Machine design methodology. Datapath Design. Introduction to Hardware Language Description HDL for both combinational and sequential circuits.

Course Code: ITCE 263

Course Title: Electronic Circuits I

Introduction to electronics, Operational amplifiers, diodes, linear and non-linear circuit applications involving op-amps and diodes. Bipolar junction and field-effect transistors: Physical structures and modes of operation. DC analysis of transistor circuits. The transistor as an amplifier and as a switch. Transistor amplifiers: small signal models, biasing of discrete circuits, and single-stage amplifier circuits. Biasing of BJT integrated circuits. Multi-stage and differential amplifiers. Frequency response of single-stage amplifiers

Course Code: ITCE 272

Course Title: Signals and Systems

Elementary continuous and discrete-time signals, signal decomposition and convolution, sampling theory and Nyquist theorem, Laplace and Z transforms, Fourier series and integral with applications, Linear Time-Invariant (LTI) systems: Properties, impulse and frequency responses, Pole-zero description, input-output difference and differential equations, transient and steady-state time responses to elementary signals.

Course Code: ITCE 300

Course Title: Digital Communications

This course deals with the fundamental aspects of the communications functions, focusing on the transmission of signals in a reliable and efficient manner. Topics covered include signal transmission, transmission media, signal encoding, interfacing, data link control, and multiplexing.

Course Code: ITCE 314

Course Title: Computer Networks I

Computer Networks and the Internet. Physical Media. Internet Backbones. Packet-Switched Networks. Protocol Layers. Application Layer. HTTP, FTP, Electronic Mail, DNS. Socket Programming. Web Servers. Transport Layer. Multiplexing and Demultiplexing. Reliable Data Transfer. Congestion Control. Network Layer and Routing. The Internet Protocol (IP). IPv6. Multicast Routing. Mobility.

Course Code: ITCE 320

Course Title: Network Programming

This course covers the fundamental topics in designing and implementation of software for distributed systems. Furthermore, the course covers the design patterns, concepts, and implementation issues and techniques of distributed systems. The course also covers the following in context of distributed systems: concurrency, message passing, remote procedure call and remote object access, object oriented network communication, mobile codes, and peer-to-peer systems.

Course Code: ITCE 341 **Course Title:** Introduction to Microprocessors
Assembly language programming. Microprocessor architecture, Instruction set. Addressing modes. Memory Interfacing and Address decoding. I/O mapping. Stack. I/O data transfer (Handshaking, Interrupts, DMA). Programmable Interface devices. Application Examples

Course Code: ITCE 352 **Course Title:** Computer Networks for IS
Concepts of data communications and computer networks. Topics covered: Introduction to data communication (signal types, transmission media, modems); physical layer; network types, topology and categories; protocols; standards; OSI model; error detection (VRC, LRC, CRC); data link control; Bit oriented data link protocols; Local Area Networks (LAN technology, Ethernet); networking devices; introduction to TCP/IP protocol suite (addressing, network layer, transport layer, ARP, ICMP, FTP, HTTP); wireless LAN.

Course Code: ITCE 362 **Course Title:** Computer Architecture I
Fundamentals of computer design; Instruction set principles and examples; Complex Instruction Set Computers (CISC) vs. Reduced Instruction set computers (RISC); Performance evaluation; Processor Design; Data Path Implementation; Control Unit; Pipelining; Microprogramming; Memory Hierarchy, Cache Memory, Virtual Memory, Fixed point and floating point arithmetic.

Course Code: ITCE 363 **Course Title:** Electronic Circuits II
The topics to be studied include amplifier characteristics, amplifier design, amplifier applications, filters and tuned amplifiers, oscillators and signal generators. Practical Op-Amps and Active Filters. TTL and CMOS Logic and Switching characteristics; Digital-to-Analog and Analog-to-Digital Converters; Voltage-to-Frequency and Frequency-to-Voltage Converters.

Course Code: ITCE 380 **Course Title:** Applied Numerical Analysis
Roots of nonlinear equations. Roots of simultaneous equations: Matrix Inversion, Gauss, Gauss-Jordan, Gauss-Seidel, Cholesky methods, Solution of nonlinear simultaneous equations. Eigen values and Eigen-vectors. Numerical solution of ordinary differential equations, Numerical differentiation and integration. Interpolation and curve fitting methods. Optimization methods. MATLAB applications of all methods.

Course Code: ITCE 416 **Course Title:** Computer Networks II
Link Layer and Local Area Networks. Error control and correction techniques. Multiple Access Protocols. Ethernet. Wireless Links. PPP. Frame Relay. ATM. Multimedia Networking and Applications. Real-Time Interactive Applications. Scheduling and Policing Mechanisms. Integrated Services. RSVP. Differentiated Services. Security in Computer Networks. Access Control; Firewalls. SSL and TLS. Network Management.

Course Code: ITCE 444 **Course Title:** Microprocessors Based Design
Interfacing digital I/O signals, Programmable Parallel interface, Interfacing, Analog I/O signals, A/D and D/A converters, Timers, Serial Interfacing techniques, Programmable serial interface, Microprocessor-based system design in measurement and control.

Course Code: ITCE 470 **Course Title:** Control Systems
Review of Laplace Transforms. Mathematical modelling of physical control system elements. Analogies, Transfer functions, Signal flow graphs. State space analysis. Transient response first and second order systems. Stability of control systems : Routh criterion, Root locus, Frequency response methods, Nyquist stability criterion. Compensation techniques. MATLAB applications in all chapters is a must.

Course Code: ITCE 471 **Course Title:** Digital Signal Processing
Review of continuous and discrete time signals and systems. More elaboration on z-transform and its applications to signal processing. Discrete Fourier transform: properties, applications and computation methods with emphasis on fast Fourier transform. Frequency analysis of discrete-time signals and systems. Design of analog and digital filters. Sampling and reconstruction of signals. DSP Applications. Introduction of 2-D signal (image) processing.

Course Code: ITCE 482 **Course Title:** Industrial Training
Each student must participate in training program in the relevant industry where he is expected to gain practical experience. At the completion of 300 hours of supervised training the student must submit a formal report .

Course Code: ITCE 498 **Course Title:** Generic Skills and Professional Issues
Management practices, communications skills; team work; project management; engineering and computer ethics and codes of ethics, economical and societal issues; and life-long learning.

Course Code: ITCE 499 **Course Title:** Senior Project
Senior students are required to carry out a design project, using knowledge and skills obtained in prior courses wherein they incorporate engineering standards and multiple realistic constraints such as economic, ethical, social, political, environmental, health and safety, manufacturability and sustainability. The students are expected to work in teams and are required to submit a written report and conduct an oral presentation.

Course Code: ITCE 417 **Course Title:** Mobile and Wireless Networking
Cellular and cordless telephony. Wireless local loop. LAN. Wireless enterprise networks. Satellite systems. Mobility management (inter-BS/system handoff; roaming under SS & CT2). Handoff Management (detection strategies; channel assignment; radio link transfer). IS-41 Network signaling (interconnection and message routing; authentication). PACS Network signaling (AIN/ISDN switch; interface; registration; call origination & termination). Cellular Digital Packet Data.

Course Code: ITCE 418 **Course Title:** Network Engineering and Design
The objective of This course is to teach a practical methodology for designing enterprise networks that are reliable, secure, and manageable. The course content includes: logical network design, customer to technology mapping, physical network design, and testing network designs. Additionally, the students will be exposed to various security and network management strategies. Various hardware and software building blocks of the networks will be studied and compared to facilitate effective network design.

Course Code: ITCE 419 **Course Title:** Wireless Sensor Networks
Wireless sensor network is an emerging technology that has attracted interest from both academia and industry. This course covers an introduction to wireless sensor networks, distributed signal processing in large scale sensor networks, energy conservation approaches, node deployment and topology, communication in sensor networks, time synchronization, and localization in sensor networks. Moreover, the students will study target localization, data fusion, and geographical energy aware routing.

Course Code: ITCE 420 **Course Title:** Virtual Private Networks
This course provides theoretical and practical experience of virtual private networks. The principles of network design and network security will be first covered in the course. Challenges of implementing VPNs, various VPN encryption techniques, authentication and authorization for VPN systems and key management systems. VPN protocols and various implementations for different scenarios and operation systems will be studied.

Course Code: ITCE 422 **Course Title:** Computer Architecture II
Advanced processor design, performance test, superscalar pipelined architecture, cache configurations and replacement policies, vector processing, multiprocessing, interconnection networks.

Course Code: ITCE 431 **Course Title:** Computer and Network Security
Introduction (threats; protection; problems ;information classification & access control plan). Communication Security (DES; IDEA; AES). Public-key cryptography (RSA; Diffie-Hallman; DSS). Hashing algorithms & message Digest (MD-x; SHA-l). Authentication. Confidentiality. key management. System security (OS security; program security). Authentication (Kerberos; X.509). E-mail security (PGP). Web security (SSL; SET). VPN (IPSec; SSH). Secure system architectures (firewalls; configuration vulnerabilities; intrusion detection).

Course Code: ITCE 425 **Course Title:** Parallel and Distributed Systems
Computer classification, Parallel computations, Architectural model for parallel processing, Measurements of performance, Distributed computing, Multiprocessor / multithreaded architectures, Compiling for multiprocessors, Interconnection networks, Message passing mechanisms.

- Course Code:** ITCE 436 **Course Title:** Multimedia Communications
Architecture, hardware, software and standards of multimedia information systems and multimedia networks. Multimedia networks, transport protocols, multicast, and resource management. Audio compression standards, and still images and video compression standards (JPEG, MPEG-1 and MPEG-2). Video conferencing standards, video servers, and digital libraries. Multimedia real-time processing, multimedia enhanced computer systems.
- Course Code:** ITCE 440 **Course Title:** GPS Based System
GPS system overview, Fundamentals of satellite navigation, Signal characteristic and information extraction., Receiver and antenna structure, GPS data errors, GPS.
- Course Code:** ITCE 446 **Course Title:** Computer Peripherals and Interfacing
Data transfer fundamentals: programmed, interrupt and DMA. Serial and parallel data. Bandwidth, access time and sustained throughput. I/O buses, controllers, protocols and standards: ISA, EISA, PCI, AGP, IDE, USB, SCSI, FireWire and others. Interfacing with basic I/O peripherals: Keyboard (KB), mouse, and display devices. Interfacing with storage peripherals: Magnetic disks: FDD, HDD, Optical disks (CD & DVD), Interfacing with digital cameras and digital communication devices. Interfacing with printers.
- Course Code:** ITCE 452 **Course Title:** Digital System Design
overview; CAD tools for digital design process; Simulation vs. synthesis design flow; Basic language concepts; VHDL modeling techniques for combinational and sequential networks; Behavioral and structural modeling of state machines. RTL Synthesis; Design and Verification; Testing, and Rapid Prototyping with FPGA.
- Course Code:** ITCE 455 **Course Title:** VLSI Design
An introduction to major concepts and overall CMOS technology and theory of operation; CMOS circuit & logic design; CMOS layout rules and techniques; CMOS circuit characterization and performance estimation; CMOS Subsystem Design; VLSI system design and testing; Design flow of modern VLSI from a systems perspective; VLSI design with (HDL); Implementation of VLSI systems with FPGAs & ASICs; Use Electronic Design Automation (EDA) tools to automate the design process of VLSI circuits and systems.
- Course Code:** ITCE 464 **Course Title:** Intelligent Systems
Introduction to intelligent systems and their applications. Introduction to fuzzy logic and artificial neural network. The use of fuzzy logic in realizing intelligent system. The use of artificial neural network in realizing intelligent robotic system. Design and implementation of fuzzy logic controller for target applications. Introducing other Artificial Intelligent system such as Genetic algorithm. The use software tools in the simulation and design of target intelligent systems.
- Course Code:** ITCE 466 **Course Title:** Industrial Electronics
Introduction to: DC, Stepper, Servo, and Brushless DC motors and Actuators. Characteristics of: MOSFET, IGBT, SCR, GTO, Triac, UJT and PUT. Single and 3-phase controlled AC-DC converters, DC/DC converters, Buck, Boost, Buck-Boost and Cuk regulators, Flyback and Forward converters, Feedback control of converters. DC/AC inverters. Electronics design of Gate/Base drive circuits and Harmonic filter. UPS circuits. Electronics control of above mentioned motors.
- Course Code:** ITCE 474 **Course Title:** Digital Control Systems
Discrete-time systems, z-transform, Difference equations, flow graphs, state variables, transfer functions, sampling and reconstruction, A/D D/A conversions, open-loop discrete-time systems, closed-loop systems, system-time response characteristics, stability analysis techniques, digital controller design, sampled-data transformation, digital filter structures, microcomputer implementation.
- Course Code:** ITCE 484 **Course Title:** Robotics
Sensors, actuators, concepts of energy, power and kinematics, static, dynamic, gearing, necessary software concepts for design and implementation of various robotic algorithms, data logging and microcontrollers.
- Course Code:** ITCE 488 **Course Title:** Biomedical Computer Applications
Applications and recent innovations in medicine covering; measurement and data analysis, patient equipment interface, standards, biomedical instrumentation, sensors, physiological measurements, analog and digital signal

processing, data acquisition, data reduction, statistical treatment of data, patient safety requirements and basic concepts in physiology relevant to the field of bioengineering.

Course Code: ITCE 493

Course Title: Selected Topics in Computer Engineering

This course is introduced to give room for offering newly emerging topics in Computer Engineering. Topics proposed for this purpose shall be submitted to the department at least one semester ahead and will be offered only upon Department approval.

Course Code: ITCS 323

Course Title: Operating Systems

Machine structure and the functions of an operating system. Operating system's structure. Process management, storage management and virtual memory. File system and I/O device handling. Protection and security. Case studies using different operating systems

Course Code: ITCS 252

Course Title: Discrete Structures I

Introduction to discrete structures and associated mathematical tools; Propositional calculus; Predicate calculus; Sequences and Summations; Inequalities; Proof techniques; Sets; Relations; Functions; Partial and Total Orderings; Graphs; Applications to computer science.

Course Code: PHYCS 101

Course Title: General Physics I

Units and measurements; brief review of vectors; Newton's laws of motion; projectile motion; work and energy; impulse and momentum; rotational dynamics; equilibrium of a rigid body; periodic motion.

Course Code: PHYCS 102

Course Title: General Physics II

Electric charges and fields; Coulomb's and Gauss's laws; electric potential; capacitors and dielectrics; direct current circuits; Kirchoff's rules; magnetic field and flux; ampere's law; induced emf; Lenz's law; mutual and self inductance; AC circuits; RLC circuit.

Course Code: MATHS 102

Course Title: Calculus II

Applications of definite integrals, including areas, volumes and surface areas of solids of revolution, arc length and centroids. Transcendental functions, indeterminate form and L'Hopital's Rule. Techniques of integration and improper integrals. Infinite series, power series. Maclaurin and Taylor Theorem.

Course Code: MATHS 205

Course Title: Differential Equations

Differential equations of first order and their solution. Separable and exact equations. Equations convertible to separable type. Higher order linear equations with constant coefficients (homogeneous and non-homogeneous). Power series method for second order linear equations. Variation of parameters. Laplace transform technique. Applications of differential equations.

Course Code: MATHS 342

Course Title: Linear Algebra and Complex Analysis

System of linear equations, Matrices, Determinants, Vector spaces, Subspaces, Linear independence, Linear transformations, Complex numbers, Analytical functions, Cauchy Integral theorem and formula, Residues, contour integration.

Course Code: CHEMY 101

Course Title: General Chemistry I

Significant figures, chemical formulas and equations; mass relations, limiting reactants and theoretical yield; Physical behavior of gases; electronic structure, periodic table, covalent bonding; Lewis structures, Molecular structures, hybridization; molecular orbitals, solutions; colligative properties. Related practical work.

College Requirement Courses Descriptions

Course Code: ENGL 154 **Course Title:** Language Development I

ENGL 155 is the second of three integrated language courses designed for IT students. The level is upper-intermediate.

Course Code: ENGL 155 **Course Title:** Language Development II

The first of a series of three integrated language courses designed specifically for IT/CS and CE majors. Special attention is given to IT related vocabulary, reading texts and writing.

Course Code: ENGL 219 **Course Title:** Technical Report Writing

This course deals with professional and technical writing. It looks at the theoretical and practical aspects of technical report writing. It also teaches the vocabulary and language structures typically found in report writing with a view to producing a full-length formal research report.

Course Code: MATHS 101 **Course Title:** Calculus I

Algebra. Functions and graphs. Trigonometry. Conic sections. Limits and continuity. Derivatives and integrals. Applications of derivatives which include mean value theorem, extrema of functions and optimization. Definite integrals and the Fundamental Theorem of Calculus.

Course Code: STAT 273 **Course Title:** Probability and Statistics

Descriptive Statistics, Introduction to probability and probability distributions. Some of probability Densities, Sampling distributions. Central limit theorem. t and F distributions. Estimation. Tests of hypotheses. Goodness of fit tests. Regression and correlation.

Course Code: ITCS 111 **Course Title:** Computer Programming I

Introduction to computers and numbering systems; Algorithmic problem solving principles; Introduction to a modern programming language (e.g. C++); Input/Output, conditional statements, iteration, files, strings, functions and arrays; Lab assignments to practice programming.

Course Code: ITCS 112 **Course Title:** Computer Programming II

Advanced language elements; data types and structures; recursion and recursive algorithms; Abstract data types; Pointer manipulation, structures, and classes; Recursion and Recursive Algorithms; Programming applications to business and scientific problems.

Course Code: ITCS 216 **Course Title:** Data Structures and Algorithms

Abstract data types, Arrays, Linked lists, Stacks, Queues, Binary Trees, Graphs, and their implementation. Related algorithms; their time complexity and implementation using Java.

University Requirements Courses Descriptions

Course Code: ARAB 110

Course Title: Arabic Language Skills

This course focuses on basic Arabic skills including form, function, and meaning. It also helps the student to appreciate and understand structures and approach them from a critical point of view, through various genres in literature.

Course Code: HIST 122

Course Title: Modern History of Bahrain and Citizenship

Spatial identity of Bahrain: Brief history of Bahrain until the 18th century; the historical roots of the formation of the national identity of Bahrain since the 18th century; the modern state and evolution of constitutional life in Bahrain; the Arabic and Islamic dimensions of the identity of Bahrain; the core values of Bahrain's society and citizenship rights (legal, political, civil and economic); duties; responsibilities and community participation; economic change and development in Bahrain; Bahrain's Gulf, Arab and international relations.

Course Code: HRLC 107

Course Title: Human Rights

This course deals with the principles of human rights in terms of the definition of human rights, scope, sources with a focus on the International Bill of Human Rights; The Charter of the United Nations; Universal Declaration of Human Rights; The International Covenant on Economics, Social and Culture rights; Convention against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment; Mechanics and the Constitutional Protection of Rights and Public Freedoms in Kingdom of Bahrain.

Course Code: ISLM 101

Course Title: Islamic Culture

An introduction to the general outline and principles of Islamic culture, its general characteristics, its relationships with other cultures, general principles of Islam in beliefs, worship, legislation and ethics.