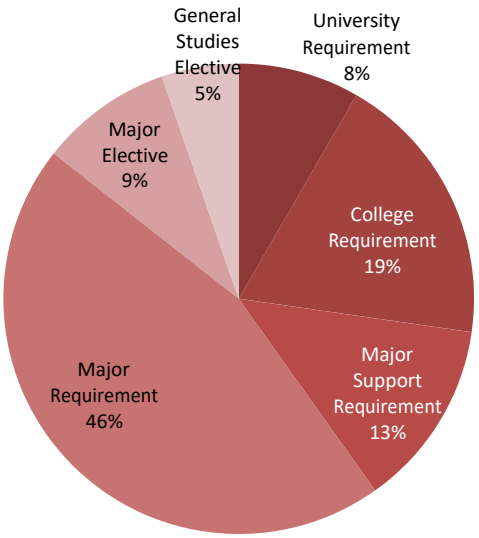
B.Sc. in Software Engineering 2017

Program Components

Course Type	CRD
University Requirement (UR)	**11**
College Requirement (CR)	**24**
Major Support Requirement (MSR)	**17**
Major Requirement (MR)	**60**
Major Elective (ME)[1]	**12**
General Studies Elective (GSE)[2]	**7**
CR- Training (Internship) **Yes**	**1**
Total Credit (CRD)	**132**



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

[2] Student must select two General Studies Electives according to the following:

- One course must be selected from any field of science:
  the following courses are suggested:
  1. CHEMY101 (GENERAL CHEMISTRY I)
  2. BIOLS102 (GENERAL BIOLOGY I)

  Or any other science course approved by the department chair.

- One course must be selected from Humanities and Social Science Component. This include 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.

Teaching Language: English

Detailed Study Plan

Year 1 - Semester 1

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 113	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			
ITCS 114	Computer Programming II	3	2	3	CR	ITCS 113	Yes
ITIS 103	Fundamentals of Information Systems	3	0	3	MR	------	Yes
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

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 214	Data Structures	3	0	3	CR	ITCS 114	Yes
ENGL 219	Technical Report Writing	3	0	3	CR	ENGL 155	No
STAT 273	Probability and Statistics	3	0	3	CR	MATHS 101	No
GSE XXX	Science Elective	X	X	4	GSE	------	No
ITSE 201	Introduction to Software Engineering	3	0	3	MR	ITCS 114	Yes

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 254	Discrete Structures I	3	0	3	MR	ITCS 113 & MATHS 101	Yes
ITCS 285	Database Management Systems	3	0	3	MR	ITCS 214	Yes
MGT 131	Introduction to Business Administration	3	0	3	MSR	------	No
MATHS 211	Linear Algebra	3	0	3	MSR	MATHS 101	No
ITSE 220	Software Requirements Engineering	3	0	3	MR	ITSE 201	Yes
ITCS 222	Computer Organization	3	0	3	MR	ITCS 214	Yes

Year 3 - Semester 5

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 255	Discrete Structures II	3	0	3	MR	ITCS 254	Yes
ITCS 325	Operating Systems	3	0	3	MR	ITCS 214 & ITCS 222	Yes
ITCS 333	Internet Software Development	3	0	3	MR	ITCS 285	Yes
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	------	No
ITSE 301	Software Project Management	3	0	3	MR	ITSE 201 & MGT 131	Yes
ITSE 302	Software Design and Architecture	3	0	3	MR	ITSE 220	Yes

Year 3 - Semester 6

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ISLM 101	Islamic Culture	3	0	3	UR	------	No
ITCS 316	Human-Computer Interaction	3	0	3	MR	ITCS 214	Yes
ITCS 347	Analysis and Design of Algorithms	3	0	3	MR	ITCS 214 & ITCS 255	Yes
ITCS 396	Professional Issues and Ethics	3	0	3	MR	ENGL 219	Yes
ITCE 314	Computer Networks I	3	2	3	MR	ITCS 114 & STAT 273	Yes
ITSE 305	Software Engineering Project	3	0	3	MR	ITSE 301 & ITSE 302	Yes

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITSE 481	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			
HRLC 107	Human Rights	2	0	2	UR	------	No
ITSE 403	Software Testing and Quality Assurance	3	0	3	MR	ITSE 305	Yes
ITXX 4XX	ITSE/ITCS 4XX Major Elective I	3	0	3	ME	As per ME list	Yes
ITXX 4XX	ITSE/ITCS 4XX Major Elective II	3	0	3	ME	As per ME list	Yes
ITSE 498	Software Engineering Senior Project	0	9	3	MR	ENG 219 & ITSE 305 & pass 85 credits	Yes

Year 4 - Semester 8

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITCS 411	Cryptography and Computer Security	3	0	3	MR	ITCS 347	Yes
ITCS 441	Parallel and Distributed Computing	3	0	3	MR	ITCS 325	Yes
GSE XXX	Humanities / Social Sciences	3	0	3	GSE	------	No
ITXX 4XX	ITSE/ITCS 4XX Major Elective III	3	0	3	ME	As per ME list	Yes
ITXX 4XX	ITSE/ITCS 4XX Major Elective IV	3	0	3	ME	As per ME list	Yes

Major Elective Courses

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ITSE 450	Object Oriented Design Patterns	3	0	3	ME	ITSE 302	Yes
ITSE 453	Advanced Software Architectures	3	0	3	ME	ITSE 302	Yes
ITSE 460	Systems Engineering	3	0	3	ME	ITSE 305	Yes
ITSE 466	Formal Methods in Software Development	3	0	3	ME	ITSE 305	Yes
ITSE 469	Software Engineering Economics	3	0	3	ME	ITSE 220	Yes
ITSE 473	Parallelism and Concurrency in Software Development	3	0	3	ME	ITSE 305	Yes
ITSE 476	Free and Open Source Software Development	3	0	3	ME	ITSE 305	Yes
ITSE 494	Selected Topics in Software Engineering	3	0	3	ME	Department Approval	Yes
ITCS 400	IT-Based Entrepreneurship	3	0	3	ME	ITCS 396 & MGT 131	Yes
ITCS 421	Geographical Information Systems	3	0	3	ME	ITCS 214	Yes
ITCS 437	Computer Graphics	3	0	3	ME	ITCS 214 & MATHS 211	Yes
ITCS 440	Intelligent Systems	3	0	3	ME	ITCS 347	Yes
ITCS 444	Mobile Application Development	3	0	3	ME	ITCS 333	Yes
ITCS 448	Cloud Computing	3	0	3	ME	ITCE 314	Yes
ITCS 453	Multimedia and Hypermedia Systems	3	0	3	ME	ITCS 214	Yes
ITCS 458	Big Data Analytics	3	0	3	ME	ITCS 255	Yes
ITCS 461	Advanced Database Management Systems	3	0	3	ME	ITCS 285	Yes
ITCS 464	Information Retrieval	3	0	3	ME	ITCS 333	Yes
ITCS 496	Physical Implementation of DBMS	3	0	3	ME	ITCS 285	Yes
ITTS 401	IT Technical Selected Topics I	3	0	3	ME	Department Approval	Yes
ITTS 402	IT Technical Selected Topics II	3	0	3	ME	Department Approval	Yes
ITTS 403	Cooperative Learning	0	12	6	ME - Training	Department Approval & Co-requisite ITSE 498	Yes

General Studies Elective Courses (Humanities / Social Sciences)

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		Lec	Prac	CRD		
FREN 141	French I	3	0	3	GSE	------
FREN 142	French II	3	0	3	GSE	FREN 141
CHL 101	Introduction to Chinese Language	3	0	3	GSE	------
EDTC 100	Teaching and Learning Technology	3	0	3	GSE	------
EDPS 144	Psychology of Learning and Memory	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	------
EDAR 126	Playing on Piano and Org 1	3	0	3	GSE	------
JAPN 101	Japanese Level I	3	0	3	GSE	------
JAPN 102	Japanese Level II	3	0	3	GSE	JAPN 101
GERM 101	Introduction to German	3	0	3	GSE	------
KL 101	Korean Language	3	0	3	GSE	------
TL 101	Turkish Language	3	0	3	GSE	------
ENGL 130	Introduction to Literature	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	------
PSYC 281	Thinking Skills	3	0	3	GSE	PSYC 103 or EDPS 241
SOCIO 161	Introduction to Sociology	3	0	3	GSE	------
SOCIO 181	Introduction to Anthropology	3	0	3	GSE	------
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	------
HISTO 212	Contemporary History of The Arab World	3	0	3	GSE	------
HISTO 281	Landmarks of Islamic Civilisation	3	0	3	GSE	------
ARAB 141	Modern Arabic Lit.	3	0	3	GSE	------
ARAB 242	Arabic Poetry In The Renaissance Period	3	0	3	GSE	------
ISLM 114	Quranic Sciences	3	0	3	GSE	------
ISLM 136	Biography of The Prophet	3	0	3	GSE	------

Course Code	Course Title	Course Hours			Course Type	Pre requisite
		Lec	Prac	CRD		
ISLM 141	Introduction to Shari'a	3	0	3	GSE	------
ISLM 252	Islamic Doctrine	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	------
GSE XXX	Other electives	X	X	3	GSE	Department Approval

Course Description

Course Code: ITIS 103 **Course Title:** Fundamentals of Information Systems
This is a foundation course that introduces students to the definitions, concepts and tools used in the IS field. It focuses on discussing the business implications of information systems, social and ethical issues it creates, their relationship with organization activities and how they support e-Commerce, knowledge management and decisions making. Topics covered include: information systems in global business today, ethical and social issues in information system, achieving operational excellence and customer intimacy, e-commerce, building and managing systems, managing knowledge and collaboration, enhancing decision making.

Course Code: ITSE 201 **Course Title:** Introduction of Software Engineering
The course covers software evolution; introduction to software engineering, software development processes, and analysis and design methods, software engineering standards and metrics. Software and system applications, emerging software engineering for cloud services. Software development and CASE tools.

Course Code: ITSE 220 **Course Title:** Software Requirements Engineering
This course covers fundamentals of requirements engineering including definition, process, characteristics, and management; eliciting requirements sources and techniques; requirements specification and documentation techniques; requirements validation techniques, and requirements analysis and system modeling.

Course Code: ITCS 254 Course Title: Discrete Structures I
This course covers basic discrete structures that are backbones of computer science. Topics include logic, predicate calculus, proofs, sets, relations, functions.

Course Code: ITCS 222 **Course Title:** Computer Organization
This course introduces basics of computer organization. Topics include data representation, basics of digital logic, basics of Assembly language, instruction formats, addressing modes, instruction set architecture, performance evaluation, single-cycle data path, and processor control. Assembly language programming is used as a means of exploring instruction set architectures.

Course Code: ITCS 255 **Course Title:** Discrete Structures II
This course is a continuation of discrete structures I. Topics include elementary number theory, asymptotic notations of growth of functions, recurrence relations and their solutions, graphs and trees, Combinatorics.

Course Code: ITCS 285 **Course Title:** Database Management Systems
This course exposes the fundamental concepts of database management systems. Topics include information management concepts, database architecture and data independence, conceptual models, relational and object oriented data models, query mechanisms, database recovery, security, integrity, backup, transaction processing, indexing.

Course Code: ITSE 301 **Course Title:** Software Project Management
This course covers the fundamental concepts, techniques, and tools for project planning and tracking including: requirements management; work breakdown and task scheduling, resource allocation, time, effort, and cost estimation, and associated tools and techniques, risk management and metrics, project tracking metrics and techniques and software configuration management.

Course Code: ITSE 302 **Course Title:** Software Design and Architecture
This course covers the design concepts including principles, tools, interactions, and quality attributes. Design strategies including conventional, object oriented, and cloud computing. Architecture, database and interface design styles, patterns, and frameworks.

Course Code: ITSE 305 **Course Title:** Software Engineering project
This course emphasizes on a real problem project to practice software requirements engineering, project management, software design and construction. Team work including management, planning and load distribution, meetings, oral and written presentations.

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 and Congestion Control. Network Layer and Routing: The Internet Protocol (IP), IPv6, Multicast Routing and Mobility.

Course Code: ITCS 316 **Course Title:** Human-Computer Interaction

This course covers techniques used to analyze and design Human-Computer Interaction (HCI) systems. Topics include user interface design methods, social interactions, interface evaluation, human capabilities, interface technology, GUI programming concepts.

Course Code: ITCS 325 **Course Title:** Operating Systems

This course presents fundamental concepts and practices to design and implement modern computer operating systems. Topics include functions and types of operating systems, operating system structure, process and thread management, process coordination, memory management and virtual memory, file system and I/O device management, protection and security.

Course Code: ITCS 333 **Course Title:** Internet Software Development

This course exposes the key technologies underlying the World-Wide Web and the principles and tools that are used to develop dynamic web applications. Topics include web design technologies (HTML, CSS style sheets), current server-side programming, web server processing, database access, event-driven programming.

Course Code: ITCS 347 **Course Title:** Analysis and Design of Algorithms

This course covers techniques used to design and analyze algorithms. Topics include time and space complexity analysis of recursive and non-recursive algorithms, brute force, divide- and – conquer, greedy, heaps, and dynamic programming design methods and their applications to real world problems.

Course Code: ITCS 396 **Course Title:** Professional Issues and Ethics

This course introduces research methodology, professional and legal issues related to IT. Topics include research types and methodology, technical report writing and presentation, ethical theories, privacy, intellectual property rights, legal IT issues and regulations, professional societies and code of conduct, global impact of IT and globalization.

Course Code: ITCS 400 **Course Title:** IT-Based Entrepreneurship

This unit will give students insight into how to identify, create, and pursue opportunities for new products and services. These opportunities have been growing rapidly due to the steady increase in digital work flows and digital customers. Google, Facebook, YouTube, Twitter, and Flickr are well-known examples of digital entrepreneurship; there are many thousands of additional examples. Specifically, this unit includes the study of entrepreneurship, opportunity analysis, feasibility analysis, intellectual property, market research, accounting, financial management, sources of funding, business models, teamwork, and business planning. Understanding these topics will allow students to more readily identify, analyze, and develop opportunities for the creation of new products and services.

Course Code: ITSE 403 **Course Title:** Software Testing and Quality Assurance

This course covers software quality concepts, review techniques and software quality assurance and quality metrics and measurements, software testing types and strategies for conventional, object-oriented and web Apps, testing tools and standards. Software security and statistical analysis.

Course Code: ITCS 411 **Course Title:** Cryptography and Computer Security

This course introduces fundamentals of computer security and cryptography. Topics include network security, cryptography, symmetric encryption methods, authentication and authorization mechanisms, public key infrastructure, electronic mail security, web security and cryptographic protocols, defense mechanisms and countermeasures, malware.

Course Code: ITCS 421 Course Title: Geographical Information Systems
This course introduces foundation in the science and technology of geographical information systems (GIS).Topics include interpreting geophysical, geological and related data, accessing database, data translators, spatial data handling, storage capabilities of a GIS system, GIS programming, integrated GIS solutions.

Course Code: ITCS 437 **Course Title:** Computer Graphics
This course covers theories and applications of the computer graphics. Topics include 2-D and 3-D modeling and transformations, viewing transformations, projections, clipping, vectors lines and planes, rendering techniques, graphical software packages and graphics systems.

Course Code: ITCS 440 **Course Title:** Intelligent Systems
This course covers analysis and design concepts of intelligent systems. Topics include problem solving methods, searching techniques, heuristic search, game playing, knowledge representations, expert systems, fuzzy logic, machine learning.

Course Code: ITCS 441 Course Title: Parallel and Distributed Computing
This course covers theory of parallelism and distributed computing. Topics include parallelism, communication, coordination, sequential and parallel processing, parallel and scalable architecture, parallel decomposition, multiple simultaneous computations, parallel computer models, parallel and concurrent programming.

Course Code: ITCS 444 **Course Title:** Mobile Application Development
This course covers key technologies underlying mobile application development. Topics include mobile platforms, GUI design, mobile programming, web services processing, database access and event-driven programming.

Course Code: ITCS 448 **Course Title:** Cloud Computing
This course covers concepts required to build a cloud infrastructure. Topics include cloud infrastructure reference model, resource management, programming models, application models, system characterizations, and implementations, deployment of cloud computing systems.

Course Code: ITSE 450 **Course Title:** Object Oriented Design patterns
This course covers study of object-oriented design patterns. Topics include detailed study of patterns such as creational, structural, and behavioral. The use and selecting of appropriate design patterns for problem solving. The practical analysis and design of software patterns.

Course Code: ITCS 453 **Course Title:** Multimedia and Hypermedia Systems
This course covers techniques used to design multimedia systems using conceptual frameworks and multimedia authoring tools. Topics include multimedia system elements, ethical and legal issues in using and creating multimedia contents, create and manipulate information using multimedia presentation concepts.

Course Code: ITSE 453 **Course Title:** Advanced Software Architectures
This course covers detailed study of software architectures for various applications including safety critical systems, embedded systems, intelligent decision support systems, mobile applications, web-based applications, big data applications, and cloud computing.

Course Code: ITCS 458 **Course Title:** Big Data Analytics
This course covers concepts, techniques and tools needed to deal with various aspects of data science practice, including data collection, cleansing, mangling, and integration, exploratory data analysis, predictive modelling, descriptive modelling, data product creation, machine learning algorithms, evaluation, and effective communication. Topics include: Data mining, Map-reduce and the new stack software, mining data streams, link analysis, clustering, classification, recommendation, and visualization of large data sets. Applications and projects using major big data tools (e.g. Spark, Hadoop, Python, or R).

Course Code: ITSE 460 **Course Title:** Systems Engineering
This course provides an introduction to systems engineering as a multi-disciplinary and well established approach to the engineering of complex systems. The topics include systems concepts, systems engineering life-cycle and processes, conceptual system design: including problem definition, technical performance measures, trade-off analyses, and system specification, preliminary and detailed system design, design review, integration of systems engineering and software engineering activities.

Course Code: ITCS 461 **Course Title:** Advanced Database Management Systems
This course covers advanced topics of database management systems. Topics Include query processing and query optimization, concurrency control, active, temporal, and multimedia databases, distributed databases and client-server architecture, data warehouse, data mining, emerging database technologies.

Course Code: ITCS 464 **Course Title:** Information Retrieval
This course is an introduction to information retrieval systems. Topics include standard concepts in information retrieval (such as documents, queries, collections, and relevance), theoretical and practical aspects of information retrieval systems, recent advances in information retrieval, web retrieval systems.

Course Code: ITSE 466 **Course Title:** Formal Methods in Software Development
In this course all issues related to formal methods in software development are considered. Topics include Concepts of formal specifications, validation, and verification of software systems, formal Mathematical specification for software via algebraic specifications and abstract model specifications, the application of formal methods to analysis, design, implementation, and software verification. Also the study of Model-driven software architectures are included.

Course Code: ITSE 469 **Course Title:** Software Engineering Economics
This course involves introduction to engineering economics and analysis fundamentals. Topics include economic planning of a software Engineering project, cost analysis and estimation, economic analysis of projects, risk analysis, budget development and for-profit and not-for-profit decision making.

Course Code: ITSE 473 **Course Title:** Parallelism and Concurrency in Software Development
The purpose of this course is to provide in-depth knowledge of parallelism and concurrency when designing and developing software solutions. Topic include parallel computations, computation graphs, Flynn's taxonomy, Parallel algorithms for data structures, Common parallel programming patterns including task parallelism, pipeline parallelism, data parallelism, divide-and-conquer parallelism, map-reduce, concurrent event processing including graphical user interfaces.

Course Code: ITSE 476 **Course Title:** Free and Open Source Software Development
This course covers the development of free and open-source software, or similar software whose source code is publicly available. The main topics are introduction to open Source software development, and its differences with proprietary software; technical infrastructure, developers' demographics and motivations; participation etiquette; best practices; Git distributed revision control system and GitHub; its societal and intellectual property licenses; its economic models; hands-on experience with free and open source software projects.

Course Code: ITSE 494 **Course Title:** Selected Topics in Software Engineering
This course covers advanced topics from various areas of software engineering not covered in CS curriculum.

Course Code: ITSE 498 **Course Title:** Senior Project
This course allows the student to use software engineering related knowledge, techniques and skills to design and develop a complete application or solve IT related problems.

Course Code: ITTS 401 **Course Title:** IT Technical Selected Topics I
This course covers advanced technical topics from various areas of information technology not covered in the curriculum.

Course Code: ITTS 402 **Course Title:** IT Technical Selected Topics II
This course covers advanced technical topics from various areas of information technology not covered in the curriculum.

Course Code: ITTS 403 **Course Title:** Cooperative Learning

This course provides the students an opportunity to working full time in a relevant industrial establishment for one academic semester. Gaining the experience of a structured job experience and working on a realistic capstone project using knowledge and skills obtained in prior courses wherein they incorporate IT standards and multiple realistic constraints such as economic, ethical, social, political, environmental, health and safety, manufacturability and sustainability. The students are expected to submit a written report of the work experience together with a written report detailing the project design efforts, and often a working prototype.

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 211 **Course Title:** Linear Algebra

Fields. Vector spaces. Linear dependence and independence. Bases. Dimensions. Subspaces. Quotient spaces. Linear transformations. Connection with matrices. Change of bases (PAQ and PAP). Eigen-values. Characteristic polynomial. Minimal polynomial. Canonical forms in simple cases. Real and complex inner-product spaces. Orthonormal bases. Orthogonal and complex unitary matrices and their eigen-values. Orthogonal and unitary reduction of real symmetric and complex Hermitian matrices.

Course Code: MGT 131 **Course Title:** Introduction to Business Administration

Overview of business administration as a field of study and practice, survey of major functional specialties within business management, accounting, finance, marketing and production, interrelationships among various specialties and foundation-level, understanding of the management profession.

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 113 **Course Title:** Computer Programming I
This course introduces problem solving and fundamental programming concepts and techniques implemented by a high-level programming language. Topics include primitive and compound data types, syntax, semantics, expressions, assignment, input, output, conditional and iterative control structures, functions.

Course Code: ITCS 114 **Course Title:** Computer Programming II
This course covers key concepts of object-oriented programming. Topics include object oriented design, encapsulation, event handlers, memory management, arrays, exception handlers, searching algorithms, programming applications.

Course Code: ITCS 214 **Course Title:** Data Structures
This course covers data structures and their implementations in an object-oriented programming language. Topics include subtyping, abstract base class, lists, stacks, queues, trees, graphs, hash tables, strategies for choosing appropriate data structure.

Course Code: ITSE 481 **Course Title:** Industrial Training
This course provides the students an opportunity to get hands on experience of working in IT industry.

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.