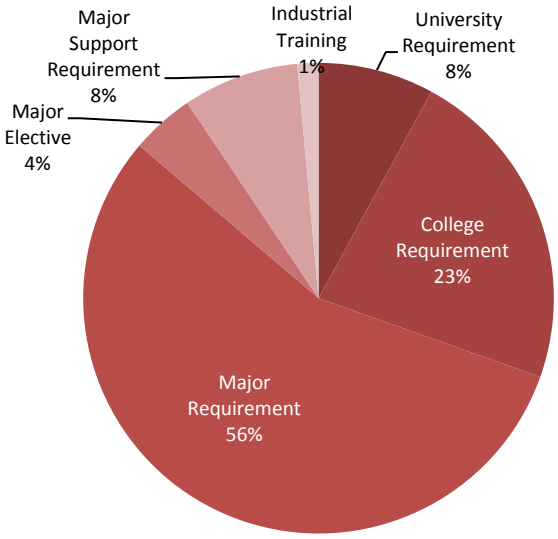
B.Sc. in Civil Engineering 2014

Program Components

Course Type	CRD
University Requirement (UR)	11
College Requirement (CR)	31
Major Requirement (MR)	77
Major Elective (ME)[1]	6
Major Support Requirement (MSR)	11
Minor Requirements (Minor)	------
MR- Industrial Training	2
Total Credit (CRD)	138



[1] Student must choose two elective courses from Major Elective Courses list.

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			
CHEMY 101	General Chemistry I	3	3	4	CR	------	No
CSC 103	Computer Programming for Scientists and Engineers	3	2	3	CR	------	No
ENGL 101	Communication Skills 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			
CENG 131	Surveying	3	3	4	MR	MATHS 101	Yes
CENG 160	Engineering Graphics and CAD	2	3	3	MR	CSC 103	Yes
ENGL 102	Composition and Reading II	3	0	3	CR	ENGL 101	No
MATHS 102	Calculus II	3	0	3	CR	MATHS 101	No
PHYCS 102	General Physics II	3	3	4	MSR	PHYCS 101	No

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 200	Computer Applications in Civil Engineering	0	6	2	MR	CSC 103	Yes
CENG 201	Civil Engineering Materials	2	3	3	MR	CHEMY 101	Yes
CENG 211	Statics	3	1	3	MR	MATHS 102 & PHYCS 102	Yes
CENG 242	Technical Report Writing and Presentation	1	1	1	MR	ENGL 102	Yes
MATHS 205	Differential Equations	3	0	3	CR	MATHS 102	No
STAT 273	Probability and Statistics	3	0	3	CR	MATHS 101	No
HRLC 107	Human Rights	2	0	2	UR	------	No

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 202	Numerical Analysis	2	3	3	MR	MATHS 205 & CENG 200	Yes
CENG 212	Mechanics of Materials	3	1	3	MR	CENG 211	Yes
CENG 231	Fluid Mechanics	2	3	3	MR	MATHS 102 & CENG 211	Yes
CENG 290	Junior Project	0	3	1	MR	CENG 242	Yes
MATHS 203	Calculus III	3	0	3	CR	MATHS 102	No
PHYCS 210	Earth Science	3	0	3	MSR	CHEMY 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
CENG 302	Construction Engineering	3	1	3	MR	CENG 160	Yes
CENG 311	Structural Analysis I	3	1	3	MR	CENG 202 & CENG 212	Yes
CENG 321	Hydraulics	2	3	3	MR	CENG 231	Yes
CENG 331	Highway Engineering	3	1	3	MR	CENG 131	Yes
CENG 341	Soil Mechanics	2	3	3	MR	CENG 212	Yes

Year 3 - Semester 6

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 301	Quantity Surveying	3	1	3	MR	CENG 160 & CENG 302	Yes
CENG 312	Structural Analysis II	3	1	3	MR	CENG 311	Yes
CENG 314	Concrete Design I	3	1	3	MR	CENG 201 & CENG 311	Yes
CENG 322	Water Supply and Sewerage	2	3	3	MR	CENG 321	Yes
ISLM 101	Islamic Culture	3	0	3	UR	------	No
MENG 300	Engineering Economics	3	1	3	CR	Completion of 60 credits	No

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 390	Industrial Training	0	6	2	MR-Training	Completion of 85 credits	Yes

Year 4 - Semester 7

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 400	Engineering Ethics	2	0	2	MR	Completion of 85 credits	Yes
CENG 411	Concrete Design II	3	1	3	MR	CENG 312 & CENG 314	Yes
CENG 417	Steel Design	3	1	3	MR	CENG 312	Yes
CENG 431	Traffic Engineering	3	1	3	MR	CENG 331 & STAT 273	Yes
CENG 4XX	Major Elective I	3	1	3	ME	As per ME list	Yes
CENG 490	Senior Design Project	0	9	3	MR	Completion of 85 credits & CENG 290	Yes

Year 4 - Semester 8

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 406	Construction Management	3	1	3	MR	CENG 301 & CENG 302	Yes
CENG 426	Wastewater Treatment	2	3	3	MR	CENG 322	Yes
CENG 442	Foundations	3	1	3	MR	CENG 341	Yes
CENG 491	Seminar	0	2	1	MR	Completion of 85 credits	Yes
CENG 4XX	Major Elective II	3	1	3	ME	As per list	Yes
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR	------	No

Major Elective Coures[1]

[1] Student must choose two elective courses from Major Elective Courses list..

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 410	Operations Research	3	1	3	ME	CENG 302	Yes
CENG 413	Advanced Structural Mechanics	3	1	3	ME	CENG 212	Yes
CENG 415	Precast and Prestressed Concrete	3	1	3	ME	CENG 411	Yes
CENG 418	Advanced Steel Design	3	1	3	ME	CENG 417	Yes
CENG 419	Finite Elements Method	3	1	3	ME	CENG 312	Yes

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CENG 421	Hydraulic and Marine Structures	3	1	3	ME	CENG 321	Yes
CENG 422	Ground Water Engineering	3	1	3	ME	CENG 321	Yes
CENG 424	Environmental Engineering	3	1	3	ME	CENG 322	Yes
CENG 425	Hydrology	3	1	3	ME	CENG 321	Yes
CENG 427	Hydro-Geo-Chemistry	3	1	3	ME	CENG 321	Yes
CENG 433	Advanced Traffic Engineering	3	1	3	ME	CENG 431	Yes
CENG 435	Pavement Design	3	1	3	ME	CENG 341	Yes
CENG 436	GIS Applications in Civil Engineering	3	1	3	ME	CENG 131 & CENG 160 & CENG 202	Yes
CENG 437	Remote Sensing Applications in Civil Engineering	3	1	3	ME	CENG 131 & CENG 160 & CENG 202	Yes
CENG 451	Special Topics	3	0	3	ME	Department Consent	Yes

Course Description

Course Code: CENG 131 **Course Title:** Surveying
Theory of errors, tape and offset surveying, levelling, theodolite, electronic distance measurement, surveying methods, setting out, circular curves, earthwork quantities, introduction to photogrammetry.

Course Code: CENG 160 **Course Title:** Engineering Graphics & Computer Aided Drawing
General introduction to engineering drawing, lettering, use of instruments and types of lines, geometrical constructions. Projections: isometric, oblique and orthographic. Simple sectional drawings. Introduction to microcomputers, AutoCAD for two dimensional drawings, architectural drawings with AutoCAD, structural drawings with AutoCAD, miscellaneous civil engineering drawings with AutoCAD.

Course Code: CENG 200 **Course Title:** Computer Applications in Civil Engineering
Computers as engineering tools, review of computer basics, formulating and solving civil engineering problems, introduction to MATLAB, scalars and arrays, operations, MATLAB programming: scripts, functions, control structures, plotting. MS-Excel: basics, creating and using formulas, mathematical functions, matrix operations, solver routine, working with charts, use of Excel for solving civil engineering problems.

Course Code: CENG 201 **Course Title:** Civil Engineering Materials
Composition of concrete, properties of concrete, cement and aggregates. Proportioning, gradation, admixtures. Forms for concrete, placing and curing, properties of hardened concrete, Bituminous materials for asphalt, concrete mix design, timber..

Course Code: CENG 202 **Course Title:** Numerical Analysis
Analysis of error in numerical computations, roots of nonlinear equations, numerical solution of linear and nonlinear systems of equations, interpolation and approximation. Numerical differentiation and integration, numerical solution of ordinary differential equations.

Course Code: CENG 211 **Course Title:** Statics
Introduction to the problems of mechanics of rigid bodies, basic concepts, force and displacement as vectors, force systems, equivalent force systems. Equilibrium of force systems (static equilibrium). Analysis of simple structures: plane and space trusses, beams and frames, center of gravity, moment of inertia.

Course Code: CENG 212 **Course Title:** Mechanics of Materials
Introduction to stress and strain concepts, stresses and deformations of axially loaded members, state of stress and state of strain with emphasis on two dimensional problems. Mechanical properties of materials, Hook's law, Poisson's ratio. Normal and shear stresses and deflections in beams. Torsion of circular bars, combined stresses. Elastic and inelastic buckling of axially loaded bars. Experiments.

Course Code: CENG 231 **Course Title:** Fluid Mechanics
Fluid properties, units of measurements, fluid statics, fluid pressure, manometers, forces on surfaces, floating bodies, kinematics of fluid flow, principle of conservation of mass, equation of motion. Dynamics of fluid flow. Integration of Euler's equation, Bernoulli's equation and its applications. Momentum equation and simple applications. Dimensional analysis and similitude. Experiments.

Course Code: CENG 242 **Course Title:** Technical Report Writing & Presentation
Technical Report Writing prepares students to design and compose effective technical documents, with particular emphasis on technical reports and oral presentations. The lecture hour is dedicated to theories, techniques and presentations. The tutorial hour is assigned to discuss the written reports feedbacks.

Course Code: CENG 290 **Course Title:** Junior Project
The course is meant to develop creative design skills in the students by exposing them to some ongoing important projects in the country and requiring them to submit report on a chosen project highlighting various design components. Field trips may be arranged in coordination with the industry. The project will emphasize independent learning and teamwork. The lectures will include introduction to process instrumentation and control engineering profession, description of various areas of specialization, professional report writing techniques and the role of process instrumentation and control engineers in the society.

Course Code: CENG 301 **Course Title:** Quantity Surveying
Introduction to civil engineering contracts, methods and process of measurement, measurement of excavation and earthworks, measurement of mass and reinforced concrete, measurement of brick and brick work, measurement of masonry, painting, water proofing and metalwork.

Course Code: CENG 302 **Course Title:** Construction Engineering
Construction team and construction site activities. Site supervision and documentation. Site health and safety requirements. Earth moving and heavy construction activities. Aggregate, concrete and asphalt production. Foundation works. Concrete, structural steel and masonry construction techniques.

Course Code: CENG 311 **Course Title:** Structural Analysis I
Equilibrium, stability and determinacy. Analysis of determinate plane and space trusses. Axial force, shear force and bending moment diagrams for determinate beams, plane and space frames and arches. Influence lines for beams and frames. Computation of displacements in determinate structures; Geometric methods: Moment area and conjugate beam methods, energy methods: virtual work method

Course Code: CENG 312 **Course Title:** Structural Analysis II
Advantages and disadvantages of indeterminate structures. Analysis of indeterminate structures by force methods; virtual work method, Castigliano's theorems. Analysis of indeterminate structures by displacement methods; slope deflection method and moment distribution method. Influence lines, matrix displacement method for plane trusses and frames. Experiments.

Course Code: CENG 314 **Course Title:** Concrete Design I

Basic behaviour, analysis and design requirements for typical reinforced concrete members. Detailed response of reinforced concrete beams in flexure. Load path tracing in buildings. Design requirements of British Standards BS 8110-1997 for members in flexure, shear, and columns. Analysis of continuous beams by moment and shear coefficients. Interaction diagrams for columns. Bond and anchorage of reinforcement. Serviceability requirements. Reinforced concrete beams with compression reinforcement. Reinforced concrete flanged sections. Concentric footing design.

Course Code: CENG 321 **Course Title:** Hydraulics

Closed conduit flow: laminar flow, relation between shear and pressure gradient, flow through circular pipes. Turbulent flow; velocity distribution, resistance of smooth and artificially roughened pipes, losses in pipes. Open channel flow: types, state and regime of flow, channel geometry. Energy and momentum principle, specific energy and force, uniform flow in channel and sewer, and channel design. Critical flow. Gradually varied flow; profiles and computation. Hydraulic jump. Experiments.

Course Code: CENG 322 **Course Title:** Water Supply and Sewerage

Fundamentals of groundwater flow, water transmission by pipelines, design of conduits, water distribution systems, reservoirs, pumping stations, wastewater systems, hydraulics of wastewater flow, design of sanitary sewers, manholes, house and building connections, population estimate, peak factors, sewer pump selection, construction and maintenance of sewer systems.

Course Code: CENG 331 **Course Title:** Highway Engineering

Introduction to transportation systems, highway planning and surveys, highway financing and economy, principle of highway locations, elements of geometric design of highways, grading operations, subgrade, subbase and base courses, pavement types, highway drainage.

Course Code: CENG 341 **Course Title:** Soil Mechanics

Soils and rocks, soil classification, analytical representation of soil composition stresses in level ground; hydrostatic and excess water pressures, concept of effective stress. Permeability and its measurement, Darcy's law. Two dimensional steady flow through soils, seepage and flow nets, Mohr-coulomb shear strength theory. Measurement of shear strength parameters. Compressibility and consolidation. Experiments.

Course Code: CENG 390 **Course Title:** Industrial Training

In this industrial training course all students in the program must participate in an approved training program in the relevant industry. At the completion of 300 hours of supervised training each student must submit a formal report and conduct an oral presentation.

Course Code: CENG 400 **Course Title:** Engineering Ethics

Scope of engineering ethics. Moral reasoning and resolving ethical dilemmas. Codes of ethics. Engineering as experimentation, engineers as responsible experimenters. Commitment to safety: safety and risk. Teamwork: definition, types of teams and groups. Confidentiality and conflict interest. Conflict management. Honesty, environmental ethics, global issues. Engineering and technological progress: optimism, pessimism and realism, shared responsibility, moral leadership.

Course Code: CENG 406 **Course Title:** Construction Management

Planning techniques, company organization, estimating & tendering, project control: CPM techniques scheduling; legal aspects of construction, change orders, bonds, contract documents: drawings, bill of quantities, specifications & forms of contract

Course Code: CENG 411 **Course Title:** Concrete Design II

Load arrangement for moment and shear envelope. Simplification of large frames into subframes. Structural detailing and drafting of solid one-way slabs, beams, and girders. Detailed design requirements for short and slender columns with uniaxial or biaxial bending. Moment magnification in slender braced and unbraced columns. Construction methods of floor slabs including: cast-in-situ one-way solid slabs, cast-in-situ two-way solid slabs, beamless flat slabs, ribbed and waffle slabs, precast hollow core slabs.

Course Code: CENG 417 **Course Title:** Steel Design
Introduction to design of steel structures. Limit state design, British Standards 5950, steel sections, design of tension members, bolted and welded connections. Design of compression members, lateral torsional buckling, design of beams and beam-columns, design of base plates.

Course Code: CENG 426 **Course Title:** Wastewater Treatment
Physical, chemical and biological characteristics of wastewater, impact of major contaminants on human health and environment. Design principles of the various treatment processes used for the removal of the major contaminants including preliminary, secondary and tertiary treatment units. Experiments.

Course Code: CENG 431 **Course Title:** Traffic Engineering
Driver and vehicle characteristics, highway alignment, spot speed, volume, travel time and delay studies. Basic traffic flow theory, basic freeway capacity, capacity of two-lanes rural highways and level of service. Signalized intersections and accident studies. Applications in highways and traffic engineering.

Course Code: CENG 442 **Course Title:** Foundations
Foundations: importance and purpose, site investigations, bearing capacity, shallow foundations, settlements, mat foundations, lateral earth pressure and retaining walls, deep foundations, soil improvements.

Course Code: CENG 490 **Course Title:** Senior Design 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: CENG 491 **Course Title:** Seminar
The course is intended to enhance students' capability to use available resources, like library and internet, to prepare seminars on selected topics in order to develop skills and apprise them of lifelong learning and contemporary issues. The students will work in teams on the assigned seminar topics and give oral presentations. The invited guest speakers will give talks on topics related to engineering profession. The students' attendance is compulsory and they will be required to submit summary of the lecture giving important salient features, which will be evaluated.

Course Code: CENG 410 **Course Title:** Operations Research
Introduction, formulation of decision making models, examples of linear programming applications. graphical solution, Analytical solution: simplex method: M-technique, two phase method, special cases, civil engineering applications, sensitivity analysis, Duality, transportation problem, assignment model, network analysis: network minimization, shortest route models, maximal flow models, project scheduling, CPM and PERT methods, queuing theory, simulation.

Course Code: CENG 413 **Course Title:** Advanced Structural Mechanics
Cross-sectional properties, unsymmetrical bending, shear center of unsymmetrical section, energy concepts including Raleigh-Ritz method, curved beams loaded in and out of plane, torsion of prismatic and thin-walled sections, elastic and inelastic buckling of columns, finite difference method.

Course Code: CENG 415 **Course Title:** Precast and Prestressed Concrete
Introduction, analysis of prestressed concrete section in flexure, Prestress loses. Design of prestressed concrete members. Composite design. Ultimate strength design. Design for shear. Indeterminate structures. Introduction to precast concrete. Applications. Specifications and codes of practice.

Course Code: CENG 418 **Course Title:** Advanced Steel Design
Plastic design of steel structures, design of plate girders, composite beams, design of beam column connections, design of roof trusses, and design of single storey industrial building.

Course Code: CENG 419 **Course Title:** Finite Elements Method
Introduction to the finite element method; analysis by the stiffness method and characteristics of the stiffness matrix, finite element forms using energy methods, element formulation using assumed displacement field and isoperimetric formulation. Scalar field problems. Galerkin formulation for torsion, potential flow and seepage flow. Use of commercially available programs, pre-processing and post-processing techniques.

Course Code: CENG 421 **Course Title:** Hydraulic and Marine Structures
Common types of hydraulic structures. Dams: types, forces, stability and design criteria, spillways. Hydraulic structures on alluvial foundations. Marine structures: tides, waves, pressure due to waves. Design considerations of wave breakers and sea walls.

Course Code: CENG 422 **Course Title:** Groundwater Engineering
Occurrence of groundwater & its movement. Steady & unsteady flow in confined, unconfined & leaky aquifers. Well flow near aquifer boundaries. Characteristics of well losses, multiple well systems, methods of constructing shallow and deep wells. Basic concepts of artificial recharge of groundwater. Sea water intrusion in aquifers.

Course Code: CENG 424 **Course Title:** Environmental Engineering
Physical, chemical and biological qualities of water. Natural purification systems. Review of engineering systems for water supply and wastewater treatment. Characteristics of air quality. Meteorology and natural purification process. Systems for air pollution control, classification and properties of solid waste. Systems for sources and energy recovery.

Course Code: CENG 425 **Course Title:** Hydrology
The hydrologic cycle, climatology. Precipitation: forms and types and Gauges, interpretation of precipitation data. Evaporation and transpiration. Infiltration. Stream flow; Stream flow hydrographs; characteristics and synthesis. Statistical and probability analysis of hydrological data. Hydrologic principles in engineering design. Water-shed modeling.

Course Code: CENG 427 **Course Title:** Hydro-Geo-Chemistry
Fundamentals of water properties and physical chemistry. Relationships of groundwater chemistry with water and hydrologic cycle. Physical and chemical characteristics of groundwater. Role of aeration zone. Solid and gas phases solubility. Groundwater chemistry in carbonate and silicate systems. Ion exchange and adsorption. Redox processes. Role of organic matter. Effects of human activities. Methods of hydro-geochemical investigations, hydro-geochemical background interpretation, groundwater chemistry and quality maps. Groundwater quality regulations.

Course Code: CENG 433 **Course Title:** Advanced Traffic Engineering
Traffic control devices, applications of control measures, traffic analysis and prediction, traffic flow theory, traffic signal control, highway capacity for freeways, urban and rural areas, accident studies. Parking studies.

Course Code: CENG 435 **Course Title:** Pavement Design
Introduction, stresses in flexible pavements, stresses in rigid pavements. Environmental factors; material behavior and characterization. Vehicle and traffic conditions. Design of highway pavements. Design of airport pavements.

Course Code: CENG 436 **Course Title:** GIS Applications in Civil Engineering
Using GIS software, to learn GIS techniques and input spatial data, spatial analysis, customization, and database management. Spatial data models normalized spatial data, spatial analysis, and measuring distances. Output GIS based maps. Application of GIS techniques in civil engineering fields such as: infrastructures and utilities mapping and management, environmental applications, road safety, hydrology, sustainable development, etc.

Course Code: CENG 437 **Course Title:** Remote Sensing Applications in Civil Engineering
Introduction to Remote Sensing. Principles and applications of aerospace remote sensing in civil engineering, electromagnetic spectrum, atmospheric transmission of energy, earth surface interactions, sensing and recording devices in the visible, infrared and microwave bands. Digital image processing, including image geometry and geometric rectification, focus radiometric rectification. Image enhancement and classification techniques, image analysis systems, and their interfacing with geo-referenced data bases. Applications in civil engineering fields such as land use and land cover, hydrology, environmental applications, road safety, sustainable development, urban planning, etc.

Course Code: CENG 451 **Course Title:** Special Topics
Any important, relevant and possibly hot topic in the field that is not covered in the approved elective list. Topics may vary based on students' interest and availability of staff.

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: PHYCS 210 **Course Title:** Earth Science
A broad and up-to-date coverage of basic topics and principles in geology, meteorology, astronomy and geophysics. Topics covered: bulk properties of rocks; rock deformation; seismology; radioactivity in the Earth; the atmosphere; Earth as a planet; solar system calculations; main energy resources; groundwater and porosity.

College Requirement Courses Descriptions

Course Code: CHEMY 101 **Course Title:** General Chemistry I
Significant figures, chemical formulas and equations; mass relations, limiting reactions 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.

Course Code: CSC 103 **Course Title:** Computer Programming for Scientists and Engineers
Introduction to computers, their uses, development, components, hardware, and software. Internal representation 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: ENGL 101 **Course Title:** Communication Skills I
This course focuses on reading skills and strategies and language development. The reading section concentrates on high-interest contemporary topics and encourages students to increase speed and efficiency. The writing component, integrated to the reading materials, reviews grammatical structures, develops language accuracy and introduces paragraph writing. Students are required to upgrade their grammar, reading, and listening skills on the internet.

Course Code: ENGL 102 **Course Title:** Composition and Reading II
A continuation of English 101 which further develops the students' skills in reading and writing. The course exposes students to wider range of reading material aimed at developing their understanding of different styles of English.

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: 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 203 **Course Title:** Calculus III
Parametric equations and polar coordinates. Vectors and surfaces. Limits, derivatives, and integrals of vector-valued functions. Partial differentiation. Multiple and line integrals and their applications. Green's and Stokes' Theorems.

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: MENG 300 **Course Title:** Engineering Economics
Introduction to engineering economics. Principles of money time relationships. Present worth analysis. Annual worth analysis. Rate of return analysis. Benefit/cost analysis. Breakeven analysis and payback period. Capital rationing among independent proposals. Replacement and retention analysis. Cost estimation and indirect cost allocation. Depreciation and depletion. Inflation and deflation. Decision making under risk. Case studies. *(One tutorial hour)

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.

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.