1. Teaching Institution	University of Technology Bahrain
2. University Department	College of Engineering
3. Programme Title	Bachelor of Science in Environmental Engineering (BSEnE)
4. Title of Final Award	Bachelor of Science in Environmental Engineering (BSEnE)
5. Mode of Attendance	Full time
6. National Qualification Framework Level and Credit	NQF Level 8 612 NQF Credits (204 ACS Credits)
7. Accreditation	
8. Other external influences	**Local External Influences/References** Ministry of Education (MOE), Higher Education Council (HEC) Bahrain Quality Authority for Education and Training (BQA) **International External Influences/References** Accreditation Board for Engineering and Technology (ABET) American Association of Environmental Engineers (AAEE)
9. Date of production/revision of this specification	September 2023

10. Aims of the Programme

The Bachelor of Science in Environmental Engineering (BSEnE) programme at UTB is concerned with the synergy that governs the interrelationships of man and nature along with the processes that impacts the balance of our desire to achieve sustainable growth while maintaining desirable environmental quality. The discipline covers areas of mathematics, basic sciences (physical, chemical and biological), engineering design and analysis, and environment management and regulations necessary to address complex environmental engineering problems. The programme includes a work-based learning course in the form of practicum and all students must undertake a design course in the form of a capstone project that requires application of environmental engineering principles to real-world problem. For achieving additional depth in specific areas of environmental engineering, technical elective courses are available in a range of topics including in-situ waste site remediation, computer modeling, and use of natural systems for wastewater treatment, and special topics and design/research project courses.

The program aims to produce graduates of the environmental engineering who shall:

1. possess the technical and professional skills needed to ensure that they are adequately prepared to enter and progress professionally in the practice of environmental engineering or progress academically in advanced areas of study;
2. be proficient in the fundamentals of mathematics and statistics, computational methods, natural and physical sciences, and chemical and environmental engineering sciences necessary to communicate and collaborate effectively with a broad spectrum of environmental professionals; and

3. have the ability to perform engineering analysis and design of water, air, and land treatment/protection systems that minimize risk to the environment and public health.

Programme Educational Objectives:

Graduates of the programme, three (3) to five (5) years after graduation shall be able to:

1. pursue careers in Environmental Engineering or related fields towards the improvement of engineering practice;
2. engage in lifelong learning towards completion of advanced/continuing education/industrial training or other learning opportunities; and
3. demonstrate professional success via promotions and/or positions of increasing responsibility.

11. Learning Outcomes, Teaching, Learning and Assessment Methods

Upon successful completion of the programme, the student will be able to:

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. communicate effectively with a range of audiences;
4. recognise ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions; and
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Teaching and Learning Methods

1. Constructive Method. Learners must be fully engaged and active in the process of constructing meaning and knowledge based on their prior knowledge and experiences through the process of doing, making, writing, designing, creating and solving. It allows teachers to implement differentiated learning, authentic assessment practices and incorporate technologies to improve individual learning experiences. It includes simulations, in-course projects, field trips, digital content, group discussions and reflections. This method strives to improve achievement by consciously developing learners' ability to consider ideas, analyze perspectives, solve problems and make decisions on their own thereby making them more responsible and independent.
2. Inquiry based Method. Learners develop cognitive skills like critical thinking and problem solving by working on questions, problems, or scenarios and formulate creative solutions. The teachers use structured, guided or open inquiry to facilitate learning. As a process, learners are involved in their learning by formulating questions, investigating, building their understanding and creating meaning and new knowledge on a certain lesson. Typically, activities include laboratory sessions and research-based activities.

3. Collaborative Method. Learners are divided into small groups to learn something together and capitalize on one's other resources and skills, evaluating one another ideas, and monitoring one another's work. It allows students to actively interact by sharing experiences and take on different roles. Typically, students are provided with problems or projects that they work on together to search for understanding, meaning, or solutions and each group is expected to work together developing or formulating solutions and present the solution in class. The activities include think-pair-share, jigsaw, or round-robin which effectively engage students to complete the tasks.
4. Experiential learning method is the process of learning by doing. By engaging students to hands on experience which attempts to apply theories and knowledge learned in the classroom to real-world situations. This may include team challenges, simulations, company visits/fieldworks and other extracurricular activities. Experiential learning opportunities exist in a variety of course- and non-course-based forms and may include community service, service-learning, undergraduate research, study abroad, and culminating experiences such as internships, student teaching, and capstone projects.

Assessment Methods

Assessment is through a combination of written examinations (essays, class tests, homework) and assessed coursework (problem sets, laboratory exercises and machine problems).

12. Programme Structure

BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING (BSEnE)

CURRICULUM PLAN EFFECTIVE AY2022-2023

REMEDIAL CLASSES

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Pre-Requisites
ENGL500	English Foundation Course	12	0	0	-
MATH500	Remedial Mathematics	3	0	0	-
			TOTAL	**0**	

FIRST YEAR

FIRST TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Pre-Requisites
MATH611	College Algebra	3	0	3	-
ENGG601	Engineering Drawing	2	2	3	-
CHEM611	General Chemistry	2	2	3	-
ENGL611	English Communication Skills 1	3	0	3	-
CSCI611A	Introduction to Computing	2	2	3	-
SOCI600	Sociology	3	0	3	-
EUTH500	Euthenics 1	1	0	0	-
			TOTAL	**18**	

SECOND TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
MATH612	Plane and Spherical Trigonometry	3	0	3	-
SCIE611	Biology	2	2	3	-
CHEM621	Inorganic Chemistry	2	2	3	CHEM611
ENGL621	English Communication Skills 2	3	0	3	ENGL611
ARAB600	Arabic Language	3	0	3	-
CENG621	Computer Programming 1	2	2	3	CSCI611A
EUTH501	Euthenics 2	1	0	0	EUTH500
			TOTAL	**18**	

THIRD TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
MATH632	Differential Calculus with Analytic Geometry	5	0	5	MATH611, MATH612
ENGL631	Speech and Oral Communication	2	2	3	ENGL621
CHEM631	Organic Chemistry	3	2	4	CHEM621
ENVE611	Elementary Surveying	2	2	3	MATH612
HIST600	History of Bahrain and GCC Region	3	0	3	-
			TOTAL	**18**	

SECOND YEAR

FIRST TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
HUMR600	Human Rights	3	0	3	SOCI600
CHEM711	Analytical Chemistry	3	2	4	CHEM631
MATH712	Integral Calculus with Differential	5	0	5	MATH632
ENGL711	Technical Writing	3	0	3	ENGL621
PHYS631	University Physics 1	2	2	3	MATH632
			TOTAL	**18**	

SECOND TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
MATH621	Probability and Statistics	3	0	3	MATH632
ENGG724	Thermodynamics	3	0	3	PHYS631
CHEM722	Environmental Biochemistry	2	2	3	SCIE611
ENGG722	Engineering Economy	3	0	3	MATH611
PHYS711	University Physics 2	2	2	3	PHYS631
ENVE721	Fundamentals of Environmental Engineering	3	0	3	SCIE611
			TOTAL	**18**	

THIRD TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
MATH733	Linear Algebra	2	2	3	MATH712
CHEM723	Physical Chemistry	2	2	3	CHEM711
ENGG723	Safety Engineering	2	0	2	-
ENVE722	Unit Operation: Fluid Mechanics	2	2	3	ENGG721
SCIE723	Environmental Microbiology	2	2	3	SCIE631
ENGG725	Engineering Mechanics	3	0	3	PHYS711
			TOTAL	**17**	

THIRD YEAR

FIRST TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
CHEM811	Water Chemistry	2	2	3	CHEM722
MATH722	Advanced Mathematics	2	2	3	MATH712
ENGG814	Engineering Materials	3	0	3	CHEM611
ENVE811	Unit Operation: Heat Transfer	2	2	3	ENGG721
ENGG852	Professional Ethics in Engineering	1	0	1	-
CHEM812	Atmospheric Chemistry	3	0	3	CHEM631
			TOTAL	**16**	

SECOND TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
ENVE821	Water Resources Engineering	3	0	3	CHEM811
ENVE822	Instrumentation and Control	2	2	3	CHEM711
ENVE823	Unit Operation: Mass Transfer	2	2	3	ENVE811
MATH732	Numerical Methods and Analysis	2	2	3	MATH722
ENVE824	Air Pollution and Prevention	3	0	3	ENVE721
ENVE825	ENVE Unit Operation: Physical and Chemical Treatment	2	2	3	ENVE722
			TOTAL	**18**	

THIRD TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
ENVE831	Air Quality Engineering	3	0	3	ENVE824
ENVE832	Soil Engineering	3	0	3	ENVE821
ENVE833	Environmental Engineering Laws and Regulations	3	0	3	ENVE722
ENVE834	Environmental Quality Systems	3	0	3	ENVE721
ENVE835	ENVE Unit Operation: Biological	2	2	3	SCIE723
ENVE836	Technopreneurship	3	0	3	ENGG722
			TOTAL	**18**	

FOURTH YEAR

FIRST TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
ENVE837	Methods of Research with Inferential Statistics	3	0	3	MATH621
ENVE838	Project and Engineering Management (Risk Analysis)	3	0	3	ENGG722

ENVE839	Engineering Hydrology	3	0	3	ENVE821
ENVE840	Oil and Gas Technology 1	3	0	3	ENVE821
ENVE8XX	Elective 1	2	2	3	ENVE834
ENVE8XX	Elective 2	2	2	3	ENVE834
			TOTAL	**18**	

SECOND TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
ENVE8XX	Elective 3	2	2	3	ENVE834
ENVE841	Environmental Planning and Design	3	0	3	ENVE834
ENVE842	Industrial Attachment	0	12	6	4th year
ENVE843	Environmental Engineering Project Design A	3	0	3	ENVE838
			TOTAL	**15**	

THIRD TRIMESTER

Course Code	Course Title	Lec Hrs	Lab Hrs	Credit Units	Prerequisites
ENVE844	Wastewater Engineering	3	0	3	ENVE835
ENVE845	Oil and Gas Technology 2	3	0	3	ENVE840
ENVE846	Environmental Impact Assessment	3	0	3	ENVE834
ENVE847	Environmental Engineering Project Design B	3	0	3	ENVE834
			TOTAL	**12**	
			Grand Total	**204**	

TECHNICAL ELECTIVES

Course Code	Course Title	Units
ENVE6XX(848)	Renewable Energy	3
ENVE6XX(849)	Climate and Global Warming	3
ENVE6XX(850)	Remote Sensing	3
ENVE6XX (851)	Hazardous Waste Management and Remediation	3
ENVE6XX(852)	Introduction to GIS	3
ENVE6XX(853)	Advanced Topics in Environmental Engineering	3
	TOTAL	9

13. Awards and Credits	
Degree/ Certificate Awarded	Bachelor's Degree
Total Units for Degree	204

Total Trimesters Completed	12

14. Personal Development Planning

1. Conduct in-house trainings and seminars related to electronics, AutoCAD, programmable logic controllers, CAD/CAM technology, microcontrollers, automation systems and robotics technology.
2. Send faculty members in local and international conferences, seminars and trainings related to their fields of specialization.
3. Support faculty members in their conduct of research projects aligned to the College's research thrusts and priorities.
4. Establish partnerships and linkages where research collaborations can be made.
5. Encourage publication of research outputs and dissemination of results through participation in international research conferences and fora.

15. Admission Criteria

Admission to UTB is open to all qualified applicants. Acceptance to the university depends on the following criteria:

A. For First Year Undergraduate Applicants

Acceptance to the University depends on the following admissions requirements:

1. Completely filled out an admission application form
2. Minimum secondary school scores 60% or its equivalent
3. UTB Placement Test (Oxford Online Placement Test (OOPT)) result
4. Submission of all required documents stated in the Admissions Policy

To be admitted to any undergraduate programme, the applicant must satisfy the minimum secondary school grades or its equivalent without the need to take the UTB placement test and remediation classes of English, and Math, as shown in the following table:

Subtest Component for Bahraini, KSA, Kuwait, Qatar, Yemen, Switzerland, USA, and Ecuador Qualification		**Programme**			
		Engineering Studies (BSIE, BSME, BSEnE)	**Computing Studies (BSCS, BSIT)**	**Business (BSBI, BSAF)**	**International Business**
Mathematics	Science/ Technical/General Track	At least 70% or C	At least 70% or C	At least 70% or C	At least 60% or D
	Commercial and Literature Tracks	At least 80% or B	At least 80% or B	At least 80% or B	At least 60% or D
Science		60	60	60	N/A
English		At least 80 or B	At least 80 or B	At least 80 or B	At least 80 or B

Subtest Component for Other Qualification (Indian, Pakistan, and West African)		**Programme**			
		Engineering Studies (BSIE, BSME, BSEnE)	**Computing Studies (BSCS, BSIT)**	**Business (BSBI, BSAF)**	**International Business**
Mathematics	Science/ Technical/General Track	At least 51 or C1	At least 51 or C1	At least 51 or C1	At least 41 or C2
	Commercial and Literature Tracks	At least 71 or B1	At least 71 or B1	At least 71 or B1	At least 41 or C2
Science		60	60	60	N/A
English		At least 71 or B1	At least 71 or B1	At least 71 or B1	At least 71 or B1

*This is applicable to Bahraini and similarly equivalent qualification.

a. Secondary Grade in English
A qualified applicant for all programmes whose secondary school grade in English is within 60-79%, needs to take the placement test in English (OOPT). If the OOPT test result is 55 or above, applicant will not take remediation course in English. However, if the result is lower than 55%, applicant will take remediation course in English.

b. TOEFL/IELTS
Qualified applicant who attains the score of at least 500 (173 CBT, 61 iBT) for TOEFL, or with a score of 5.5 for IELTS, is exempted to sit the required English placement test.

c. Secondary Grade in Math
A qualified applicant for Engineering programme who has a secondary grade score in Math of 60-79% for commercial track and 60-69% for scientific and technical tracks and lower than 60% for the International Business programme has to take the remediation course in Math.

Note: UTB can accept new students equivalent to 5% of the total enrollment where student applicant has a CGPA below 60% but not lower than 50% from Bahraini Schools; below 41% but not lower than 33% from Indian and Pakistan Schools; and for other non-Bahrain based Schools, it will be based on the passing mark of the school. The 5% is subject to strict evaluation by the dean and the applicant's score in the OOPT and the secondary school grades.

d. Secondary Grade in Science
A qualified applicant for Engineering (BSIE, BSME, BSEnE), Computing (BSCS, BSIT) or Business (BSBI, BASF) programme who has a secondary grade score in science of lower than 60% has to take tutorial class in general science before taking any university-level science course.

B. For Undergraduate Transfer Student Applicants

Application Requirements:

1. Completely filled out an admission application form
2. Official Transcript of Records (TOR) from the university previously attended. Rules and regulations of the HEC-Bahrain regarding the authentication of foreign certificates and private school certificates are to be applied when necessary.
3. Course description of all completed courses for which transfer credit is sought (authenticated by the originating university)
4. Certificate of Transfer from the university previously attended stamped by MOE, if any.
5. Withdrawal Certificate stamped by MOE
6. Submission of all required documents stated in the admissions policy.
7. The applicant should have a good moral standing from the university from which he/she is transferring.

Admissions Requirements:

a. For Bahrain and KSA qualifications, the applicant should have at least a secondary school average of 60%. For non-Bahrain secondary qualifications (Indian and Pakistan) the applicant should have at least 41% secondary school average; and for other non-Bahraini qualifications please refer to the table of cut-off.
b. If the applicant has taken and passed courses in English and Mathematics in the previous university, the applicant will be exempted in taking the remedial courses in both English and Mathematics. The applicant may proceed to mainstream university courses and is eligible to apply for credit transfer.
c. If the applicant has not taken any courses in English, he/she shall take the OOPT. If the results on the two parts of OOPT results is passed, he will proceed to university English courses, otherwise, he/she will enroll the remedial courses in English where he/she fails.
d. If the applicant has not taken any course in Mathematics, the basis for evaluation whether remedial course in mathematics is required or not is the score in mathematics subjects in his/her last year in the secondary school certificate using the table presented earlier.

The transfer of course credits is accepted at UTB provided that courses applied for crediting are equivalent to the courses where credit will be transferred. Practicum (Internship) course is eligible for credit transfer with the same practicum (internship) course from another university or re-admitted student from UTB.

The University requires the undergraduate student to complete at least 50% of the required credit units/hours of a programme in residence at UTB. The maximum credit units/hours that are eligible for transfer credits should not exceed two-thirds (66%) of the required credit units/hours based on his/her original degree from another university.

16. CGPA Requirement for Graduation

The required CGPA for an undergraduate student to be eligible for graduation is 2.0 out of 4.

17. Key Resources of information about the programme

1. Included in the College Catalogue
2. Uploaded on the UTB website

18.	BSEnE CURRICULUM SKILLS MAPPING										
Year/ Level	Course Code	Course Title	Core (C) or Option (O)	Programme Intended Learning Outcomes / Student Outcomes						
				SO1	SO2	SO3	SO4	SO5	SO6	SO7
Year 1 1st Tri	MATH611	College Algebra	(C)	✓						
	ENGG601	Engineering Drawing	(C)							
	CHEM611	General Chemistry 1	(C)							
	ENGL611	English Communication Skills 1	(C)							
	CENG611	Introduction to Computing	(C)							
	SOCI600	Sociology	(C)							
Year 1 2nd Tri	MATH612	Plane and Spherical Trigonometry	(C)	✓						
	SCIE611	Biology	(C)	✓				✓	✓	
	CHEM621	Inorganic Chemistry	(C)	✓		✓		✓	✓	✓
	ENGL621	English Communication Skills 2	(C)			✓				
	ARAB600	Arabic Language	(C)				✓			
	CENG621	Computer Programming 1	(C)	✓					✓	
Year 1 3rd Tri	MATH631	Differential Calculus with Analytic Geometry	(C)	✓						
	ENGL631	Speech and Oral Communication	(C)			✓				
	CHEM631	Organic Chemistry	(C)	✓					✓	✓
	ENVE611	Elementary Surveying	(C)	✓		✓		✓	✓	✓
	HIST600	History of Bahrain and GCC Region	(C)				✓			
Year 2 1st Tri	HUMR600	Human Rights	(C)				✓			
	CHEM711	Analytical Chemistry	(C)	✓				✓	✓	✓
	MATH711	Integral Calculus with Differential Equations	(C)	✓						
	ENGL711	Technical Writing	(C)			✓				
	PHYS631	University Physics 1	(C)	✓					✓	
Year 2 2nd Tri	MATH621	Probability and Statistics	(C)	✓						
	ENGG721	Thermodynamics	(C)	✓						✓
	CHEM722	Environmental Biochemistry	(C)	✓						
	ENGG722	Engineering Economy	(C)	✓			✓			
	PHYS711	University Physics 2	(C)	✓					✓	
	ENVE721	Fundamentals of Environmental Engineering	(C)	✓	✓					
	MATH733	Linear Algebra	(C)	✓		✓		✓	✓	

Year 2 3rd Tri	CHEM723	Physical Chemistry	(C)	✓	✓					
	ENGG723	Safety Engineering	(C)				✓			
	ENVE722	Unit Operation: Fluid Mechanics	(C)	✓	✓					
	SCIE723	Environmental Microbiology	(C)	✓						
	ENGG724	Engineering Mechanics	(C)	✓						
Year 3 1st Tri	CHEM811	Water Chemistry	(C)	✓	✓				✓	✓
	MATH722	Advanced Mathematics	(C)	✓					✓	✓
	ENGG811	Engineering Materials	(C)	✓			✓	✓		
	ENVE614	Unit Operation: Heat Transfer	(C)	✓	✓					✓
	ENGG811	Professional Ethics and Engineering Laws	(C)				✓			
	CHEM811	Atmospheric Chemistry	(C)	✓	✓					✓
Year 3 2nd Tri	ENVE821	Water Resources Engineering	(C)	✓	✓					✓
	ENVE822	Instrumentation and Control	(C)	✓					✓	✓
	ENVE823	Unit Operation: Mass Transfer	(C)	✓	✓				✓	✓
	MATH732	Numerical Methods and Analysis	(C)	✓				✓	✓	✓
	ENVE824	Air Pollution and Prevention	(C)	✓	✓					✓
	ENVE825	ENVE Unit Operation: Physical and Chemical Treatment	(C)	✓					✓	✓
Year 3 3rd Tri	ENVE831	Air Quality Engineering	(C)	✓	✓		✓			✓
	ENVE832	Soil Engineering	(C)	✓	✓					✓
	ENVE833	Environmental Engineering Laws and Regulations	(C)		✓	✓	✓	✓		✓
	ENVE834	Environmental Quality Systems Engineering	(C)	✓	✓					
	ENVE835	Unit Operation: Biological Treatment	(C)	✓	✓			✓	✓	
	ENVE836	Technopeneurship	(C)			✓	✓			✓
Year 4 1st Tri	ENVE837	Methods of Research with Inferential Statistics	(C)		✓	✓				✓
	ENVE838	Project and Engineering Management (Risk Analysis)	(C)	✓			✓		✓	
	ENVE839	Engineering Hydrology		✓	✓					
	ENVE840	Oil and Gas Technology 1	(C)							✓
Year 4 2nd Tri	ENVE849	Climate and Global Warming Programme Electives	(O)	✓						
	ENVE841	Environmental Planning and Design	(C)	✓	✓					
	ENVE842	Industrial Attachment	(C)	✓	✓		✓	✓	✓	✓

	ENVE843	Environmental Engineering Project Design A	(C)	✓	✓		✓		✓	
Year 4 3rd Tri	ENVE844	Wastewater Engineering	(C)	✓	✓					
	ENVE845	Oil and Gas Technology 2	(C)							✓
	ENVE846	Environmental Impact Assessment	(C)			✓	✓			✓
	ENVE847	Environmental Engineering Project Design B	(C)	✓	✓		✓	✓	✓	✓

BACHELOROF SCIENCE IN ENVIRONMENTAL ENGINEEING (BSEnE)

CURRICULUM PLAN EFFECTIVE AY2022-2023

COURSES DESCRIPTION

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITE(S)
MATH500	REMEDIAL MATHEMATICS	3	0	0	
This course is a foundation in mathematics focusing on the building of the knowledge and skills and understanding to solve problems in college algebra and trigonometry. It deals with the topics on equations and Inequalities; functions and graphs; polynomial and rational Functions; exponential and logarithmic functions; trigonometric functions; trigonometric identities and equations; application of trigonometry; systems of equations and inequalities; and matrices. It also includes the application of the mathematical thinking process.					
ENGL500	ENGLISH FOUNDATION COURSE	9	0	0	
This course is a required foundation course for entering students whose English language skills need further improvement and enhancement to be able to cope with the university's academic courses. This course introduces the students to the English language where they get involved and engaged in the learning process. It utilizes an integrated approach in developing the students' English macro communication skills in speaking, listening, grammar, and vocabulary in one phase (pre-intermediate) which will serve as the benchmark for the next level first year English course. Furthermore, the course intensifies its intended learning objectives with the comprehensive utilization of audio-lingual presentations, includes information related to dictionary use, basic grammar rules, daily use vocabulary words through a variety of contexts, written responses, writing structures, settings of writing, and the process of forming written and spoken communications. Hence, the students are expected to gain more knowledge to communicate effectively in English.					
MATH611	COLLEGE ALGEBRA	3	0	3	
This course is designed to familiarize learners with the main theories, principles, and concepts of college algebra that are useful in the analysis and simplification of basic and some advanced mathematical problems. Content includes functions that are polynomial, rational, exponential, logarithmic and related equations. Sketching graphs, Matrices, determinants, progressions and inequalities as applied to engineering.					
ENGG611	ENGINEERING DRAWING	2	2	3	
This course deals with core theories, principles, and concepts of the topics of This course deals with the application of Computer-Aided Drafting Design (CADD) in sketching and drawing to produce engineering drawings. The student will learn the appropriate AutoCAD drawing and modifying commands to generate 2D drawings and orthogonal projections of 3D drawings. The course will cover editing, modifying and plotting 2D and 3D drawings.					
CHEM611	GENERAL CHEMISTRY 1	2	2	3	
This course demonstrates atomic theories, relationships between structure and properties of matter, scientific notation, density calculation, atomic structure and energy levels, periodic table, ions formation					

and chemical bonding, chemical reactions and emphasizing the chemical change, balancing equation, Discussion on gas law includes properties and application of gas laws, Acids and bases, solution and clarification of acid – base concept.

ENGL611	ENGLISH COMMUNICATION SKILLS 1	3	0	3	

This is an introductory course in English communication designed to provide comprehensive, up-to-date and relevant instruction in the correct use of grammar. It intends to build up students' confidence in communicating their thoughts, ideas, information and messages through the functions and structures of different words, phrases, clauses, sentences and paragraphs. In addition, the integration of language skills increases their communicative competence and prepares them for the academic and social challenges in college and beyond.

CENG611	INTRODUCTION TO COMPUTING	2	2	3	

This course covers a detailed knowledge and understanding of computer hardware and software. It includes the discussion of number systems, networking and the internet and the interdisciplinary science of computing. It also provides a discussion of programme development structures and algorithm and flowchart development.

The laboratory focuses on configuring web browser security, configuring E-mail security, configuring OS security and working with Microsoft Excel and Visio.

SOCI600	SOCIOLOGY	3	0	3	

This course is designed to expose students to a detailed approach to studying society. It intends to give emphasis on the sociological perspectives, relationships with other social sciences, and the main figures in sociological development, including an introduction to culture, the transformation of societies, the importance of socialization, social groups, deviance and social control. Further, it incorporates the discussions on social institutions that enable the college students to understand the economic perspective from ancient to present, the evolution of education and the current viewpoint of family.

EUTH400	EUTHENICS 1	1	0	0	-

This course is designed to bring in the policies and procedures in the university, to guide the students in the performance of their respective roles and to become adept on ideals needed in their academic pursuit. Thus, students are oriented on the history, vision, mission, values and objectives of the university, the services and academic support available, the academic and non-academic policies, the different misconduct and violations with corresponding penalties in which the learning objectives are better facilitated by various classroom discussion through collaborative teamwork learning experience.

MATH612	PLANE AND SPHERICAL TRIGONOMETRY	3	0	3	

This course is designed to familiarize learners with main theories, principles and concepts of plane and spherical trigonometry that are useful in analysis and simplification of some advanced mathematical problems. The course covers topics on angles and their measurements, trigonometric/circular functions, inverse trigonometric functions, identities, graphs of trigonometric functions, solutions of trigonometric equations, solutions of right and oblique plane triangles, introduction to spherical trigonometry and its applications.

SCIE611	BIOLOGY	2	2	3	
This course focuses on the detailed knowledge and understanding of the fundamental life processes and functions of living systems including the nature of knowledge relating to cell structure, function and metabolism, bioenergetics, genetics and biotechnology, cellular reproduction and cell division, evolution, biodiversity, and ecology. The students will demonstrate the importance of explanations based on evidence through inquiry-based laboratory activities to provide insight into scientific method.					
CHEM621	INORGANIC CHEMISTRY	2	2	3	CHEM611
This course is the study of the synthesis, reactions, structures and properties of compounds of the elements. Inorganic chemistry encompasses the compounds - both molecular and extended solids - of everything else in the periodic table and overlaps with organic chemistry in the area of organometallic chemistry, in which metals are bonded to carbon-containing ligands and molecules. Inorganic chemistry is fundamental to many practical technologies including catalysis and materials (structural, electronic, magnetic etc.), energy conversion and storage, and electronics. Inorganic compounds are also found in biological systems where they are essential to life processes.					
ENGL621	ENGLISH COMMUNICATION SKILLS 2	3	0	3	ENGL611
This is an intermediate course in English communication geared towards equipping the college students with writing skills in preparation for academic writing. It progresses from familiarizing the sentence conventions to balancing the structures of the sentence for variation and rhythm. Further, it enables students to follow the principles that govern the composition writing in achieving unity, coherence and emphasis; to improve their expository, descriptive, narrative and argumentative works and to get hold of the discipline in academic writing for future advantages by providing them the opportunity in adhering the process of writing for effective communication.					
ARAB600	ARABIC LANGUAGE	3	0	3	-
The course focuses on the fundamentals of Arabic language, such as reading, analyzing, and critique. It explains the characteristics of the required texts, which deal with different literary genres, prose and poetry. The course also focuses on the understanding and application of grammatical rules and basic morphological methods in Arabic, taking into account the correct spelling skills.					
CENG621	COMPUTER PROGRAMMING 1	2	2	3	CENG611
This course covers detailed knowledge of problem solving and algorithm development, with emphasis on developing good programming habits, and programming in a modern computer language. The course familiarizes the students with the features of object-oriented programming and its applications to solve problems. It includes a discussion of an overview of the Java language syntax, including packages, classes, methods, variables, conditional statements, and control flow.The laboratory focuses on the implementation of the programming theories and concepts in Java programming language using the tool Java Eclipse.					

EUTH401	EUTHENICS 2	1	0	0	EUTH400
This course is designed to provide discussion on the students' rules and regulations of the university in order to practice the right conduct of behavior inside and outside the university premises. It intends to teach the students on the different stages of personality development, the equivalent penalties in different academic offences and factors that influence behavioral multiple intelligences. Further, the incorporation of oral/written communication through individual and group discussions can encourage learners to ponder on the meaning of life and discover the purpose of their existence.					
MATH631	DIFFERENTIAL CALCULUS WITH ANALYTIC GEOMETRY	5	0	5	MATH611 MATH622
This course is intended to develop practical skills in differential calculus and analytic geometry. Emphasis is placed on functions, limits and continuity, fundamental concepts of analytic geometry, explicit and implicit differentiation of algebraic and transcendental functions, conics, higher derivatives, polar coordinates and its applications (equations of tangent and normal lines, sketching polynomial curves, maxima and minima problems and time rates).					
ENGL631	SPEECH AND ORAL COMMUNICATION	2	2	3	ENGL621
This is a developmental course in English communication geared towards competent, efficient and effective interpersonal speaking across communicative contexts. It refines oral communication skills through accurate articulation of segmental phonemes, pronunciation drills and enunciation of the suprasegmental features of speech, specifically sentential stress and intonation. Further, it incorporates the mechanics and techniques of speech craft and delivery with emphasis on practical speaking experiences and analysis of audience psychology, which are deemed applicable in diverse speech situations.					
CHEM631	ORGANIC CHEMISTRY	3	2	4	CHEM621
This is a course that deals with the different hydrocarbons and their derivatives with emphasis on the theoretical concepts, properties, and stereochemistry, synthesis and reaction mechanisms of organic reactions. The laboratory part includes techniques such as purification /separation, physical characterization, reaction types, and synthesis of organic compounds.					
HUMR600	HUMAN RIGHTS	3	0	3	SOCI600
This course makes the students able to know the background, main concepts of Human Rights and the philosophical thoughts and Islamic view which contribute to modern Human Rights. It makes them able to analyze what is mentioned in different kinds of Human Rights sources such as Universal Declaration of Human Rights, International Covenant on Civil and Political Rights and International Covenant on Economic, Social and Cultural Rights. It deals in the same approach with the National Sources of Human Rights such as the Constitutional Law of Kingdom of Bahrain and National Action Charter with applications as well. The course makes the students able to analyze, discuss and debate Human Rights issues in different ways.					

HIST600	HISTORY OF BAHRAIN AND THE GCC REGION	3	0	3	

This Course includes the history of the Kingdom of Bahrain and the Arabian Gulf region. It includes the important events in Bahrain and the Arabian Gulf region and their impact on the current situation. It covers the strategic importance of Bahrain, starting with "Ancient civilizations and passing through" the Islamic era, Bahrain's entry into Islam, Portuguese occupation, competition of powers in the 17th century and the rise of a tribe of Al-Atub. It includes the history of Bahrain under the British protection and the conventions between Bahrain and Great Britain up to British troops leaving the region. It describes the places and persons as well as the historical developments and achievement in Bahrain during the time of Al- Khalifah. It includes independence of Bahrain, issuing of the first constitutional law, reform project by His Majesty King Hamad, constitutional amendments, establishment of GCC, history of Arab Gulf states. It makes the student able to present his patriotic character through historical discussions.

ENVE611	ELEMENTARY SURVEYING	2	2	3	MATH622

This course introduces the fundamental principles and practices common to the industry for working as a land surveyor. Provide exposure to common software and other methods for site surveying and prepare the student for other survey courses. Care and operation of instruments, concepts of horizontal and vertical control; measurement of horizontal distances, vertical angles and elevation differences, basic surveying computations and field practice. Coverage includes the definition and analysis of errors of measurement.

CHEM711	ANALYTICAL CHEMISTRY	3	2	4	CHEM631

This course includes an introduction to the theory and applications of analytical chemistry. Topics consist of chemical analysis, acids and bases, volumetric and gravimetric analysis, fundamentals of spectroscopy, chromatography and electro analytical methods of analysis. The laboratory experiments include acid-base behavior, spectroscopy (UV-VIS and AAS) and chromatography (HPLC & GC).

MATH711	INTEGRAL CALCULUS WITH DIFFERENTIAL EQUATIONS	5	0	5	MATH631

This course provides the students with knowledge and understanding of core concepts, theories and principles in evaluating definite and indefinite integrals and their applications in solving engineering and computing problems. The course also covers solutions to ordinary differential equations which can be used in modeling important applications in the scientific and engineering fields.

ENGL711	TECHNICAL WRITING	3	0	3	ENGL621
This is an advanced course in English academic writing designed to deal with the application of the technical writing principles with the correspondence on business, science, and technology. It aims to develop the technical writing skills and communication of the college students thru the discussions of its elements and ethics with the use of digital technologies. Furthermore, it enables students to adapt the various communication routes in the workplace, to conceptualize suitable contents of technical writing, to understand the characteristics and other methods of communication techniques, to plan and organize advanced level tasks and to work effectively and with accountability with other team members in a creative and productive manner, in any language learning scenario when achieving personal and group outcomes.					
PHYS631	UNIVERSITY PHYSICS 1	2	2	3	MATH631
This course is designed to explore the concepts of motion using vectors and other mathematical models and their advanced application, such as the application of Newton's laws of motion, projectile motion, work, energy, momentum and impulse, rotational dynamics, equilibrium of a rigid body, and periodic motion.					
MATH621	PROBABILITY AND STATISTICS	3	0	3	MATH631
This course provides a demonstration of the main concepts of probability and statistics with applications. IT also covers identifying the theorem of probability and linked with real life problems. How to differentiate between the combination and permutation. Explain how to find the mean and variance from the moment generating function. Explain and interpret the findings from different hypothesis tests for decision making. Finally, SPSS will be used to run the statistical measures (e.g. hypothesis tests and regression model).					
ENGG721	THERMODYNAMICS	3	0	3	PHYS711
Thermodynamics deals with the study associated with details of the properties of the pure substance to adapt the necessary process related to energy concepts, ideal gas laws, work and heat, processes of ideal gases, and gas and steam cycles. It also includes a critical evaluation of various laws and their practical applications of thermodynamic principles in power plan.					
CHEM722	ENVIRONMENTAL BIOCHEMISTRY	2	2	3	SCIE611
This course provides students with knowledge of the fundamental principles of chemistry applied to life processes. It covers chemistry of important constituents of living matter, biosynthesis, bioenergetics, metabolic control, and transport mechanism. The laboratory part includes the separation, identification, and characterization of biomolecules.					
ENGG722	ENGINEERING ECONOMY	3	0	3	MATH611
This course deals with the advanced study of the core theories, principles and concepts of economic environment, interest and money-time relationship, depreciation, capital financing, comparing alternatives, replacement studies, break-even analysis, benefit cost ratio, and benefit cost difference. It presents mathematical techniques and practical advice for evaluating decisions in the design and operation of engineering systems.					

PHYS711	UNIVERSITY PHYSICS 2	2	2	3	PHYS63 MATH711
This course is designed to explore the concepts of electricity and magnetism using the concepts of mechanics, vectors, and other mathematical models and their advanced application, such as application of Coulomb's law, Gauss's law, Ohm's law, Kirchhoff's laws, electric potential and potential difference, basic circuits, series and parallel circuits and combinations, magnetic field and flux, induced EMF and applications such as electric motors and basic AC electric generators.					
ENVE721	FUNDAMENTALS OF ENVIRONMENTAL ENGINEERING	3	0	3	SCIE611
This is an introductory course that presents general concepts and topics on the environment, aquatic and terrestrial ecosystems. Topics include the biological and chemical principles that relate to current environmental issues, conservation of plants and animals, energy flow as well as nutrient cycling, basic ecological and technological concerns and solutions to environmental problems.					
MATH733	LINEAR ALGEBRA	2	2	3	MATH711
This course uses specialist level skills to relate to and adapt main and core theories and concepts in the study of matrices and determinants, and their applications in numerical solutions of systems of linear equations. It also includes important topics such as linear transformations, eigenvalues and eigenvectors, complex vectors and matrices and numerical linear algebra. In the laboratory, MATLAB is used as mathematical software and solutions to a variety of mathematical problems are determined.					
CHEM723	PHYSICAL CHEMISTRY	3	2	4	CHEM711
This course presents an intensive overview of the laws of thermodynamics followed by applications to the properties of gases, liquids, and solids, as well as chemical reaction thermodynamics and the kinetic theory of gases at equilibrium. It also deals with the study of chemical kinetics with applications to gases, solutions, and phase equilibria to provide a firm foundation for understanding the physical principles that govern chemical and biological systems. Laboratories cover physical chemistry techniques drawn from these areas.					
ENGG723	SAFETY ENGINEERING	2	0	2	
This course deals with the detailed study of the principles of safety engineering and applications of safety principles to industrial and commercial systems. It covers topics concerning safety management, occupational health, fire prevention and control, electrical safety and environmental safety. Further, students will learn how to conduct risk analysis and some of the mitigation measures.					
ENVE722	UNIT OPERATION: FLUID MECHANICS	2		3	ENGG721
This is an introduction to the basic phenomena and principles of fluid flow. The course discusses fluid properties, fluid statics, conservation of mass, momentum, and energy. Emphasis is on quantitative analysis of velocities, pressures, shear stresses, and flow forces. Measurement of fluid properties, pressures, velocities, and flow forces are performed in laboratory sessions.					
SCIE723	Environmental Microbiology	2	2	3	SCIE611
This course covers the study of the basic microbiological concepts and techniques. Topics include the study of microorganisms in natural environments like specialized techniques for sampling, culture,					

isolation and identification. Also included are the ecology and diversity of microbial communities in soil, water, and air as well as in unusual environments such as deep-sea hydrothermal vents. Topics include wastewater treatment, bioremediation, biofilm engineering, and other applications related to public health, agriculture, food science, and industry.					
ENGG724	ENGINEERING MECHANICS	3	0	3	PHYS711
This course deals with the core theories, principles and concepts of force systems, force components, free body diagrams, vectors, resultant of force systems, moment of forces, and equilibrium of rigid bodies. It also includes critical analysis of structures, methods of analysis of trusses, and, distributed forces centroids and center of gravity, and the theory and application of friction.					
CHEM811	WATER CHEMISTRY	2	2	3	CHEM722
This course is a study of geochemical and biochemical processes that influence the chemical makeup of water. Emphasis is placed on controls affecting the chemical quality of natural waters and models used to describe the presence and concentration of dissolved inorganic and organic constituents and dissolved gases. Techniques used to interpret and evaluate chemical analyses are covered along with sampling methods and use of standard water testing equipment.					
MATH722	ADVANCED MATHEMATICS	2	2	3	MATH711
This course deals with the study of complex numbers, series solutions of ordinary differential equations by power series, Bessel Function, Frobenius method. Basics of Fourier series, Fourier transform, Laplace and inverse Laplace Transforms. Using MATLAB or other mathematical software in order to solve mathematical problems.					
ENGG811	ENGINEERING MATERIALS	3	0	3	EM611
This course deals with the study of the core principle and concept of engineering material science. It covers the defining features of properties and structure of different engineering materials. It discusses the classifications of materials such as metals, polymers, ceramics, and composites. It also covers the formation of bonds and forces between particles, amorphous and crystalline structure, the impact factor, solid solutions and phase diagram, and defects in crystalline materials. It also covers the analysis of the physical, mechanical, electrical and magnetic properties of materials. This also emphasizes the various considerations in selecting materials appropriate for a particular application.					
ENVE811	UNIT OPERATION: HEAT TRANSFER	2	2	3	GG721
This course covers the basic principles of heat fluxes, in the forms of conduction, convection, and radiation of heat. Analytical and numerical methods are presented for two-dimensional conduction problems. Specific topics include forced convection in laminar and turbulent flows; heat transfer at low rates, evaporation; and thermal radiation. Problems and examples will emphasize modeling of complex systems drawn from environmental applications such as water and waste management.					
ENGG811	PROFESSIONAL ETHICS AND ENGINEERING LAWS	1	0	1	
This course explores the core theories, principles and concepts in the field of ethics as it relates to engineering practice. This framework is used to examine several case studies of ethical problems in engineering. It discusses the core concepts of environmental protection and sustainability to understand					

how they relate to engineering ethics. The course is intended to promote greater reflection by engineers on their activities to better understand the social dimensions of engineering practice.

CHEM811	ATMOSPHERIC CHEMISTRY	3	0	3	EM631

This course deals with the fundamental chemical processes of the Earth's atmosphere. The topics include atmosphere layer, atmospheric transport, biogeochemical cycles of gaseous nitrogen, oxygen, carbon and sulfur compounds, aerosol, fog, smog and acid rain, troposphere air pollutions, ozone hole and stratosphere ozone depletion, greenhouse gases and global warming, industrial revolution and climate change, chemical kinetics in mesosphere and thermosphere.

ENVE821	WATER RESOURCES ENGINEERING	3	0	3	EM811

This course focuses on the concept, theory, design, and operation of urban water supply systems. Emphasis will be placed upon a fundamental understanding of commonly used water collection and treatment technologies. Major sections of the course cover water cycle, water consumption and demand, water collection, storage and transportation, drinking water quality, conventional surface water treatment unit operations and processes, advanced water treatment technologies, water stabilization and corrosion control, urban water distribution and transmission, water reclamation and total water management. The course aims to introduce to students the basic concept of water resources engineering and the knowledge of urban water supply. At the end of this course, students who fulfill the requirement of the course will be able to present the principles and theories behind the common water collection and treatment technologies and to conduct conceptual design of freshwater collection systems, common surface water treatment processes and urban water distribution systems.

ENVE822	INSTRUMENTATION AND CONTROL	2	2	3	CHEM711

Introduction to the fundamental concepts of instrumentation and measurement. The components of instrumentation (transducers, amplifiers, filters) are discussed. Specific measurement techniques including mass spectometry, spectroscopy, chromatography (gas, ion exchange, HPLC), electro-chemical probes (membrane electrodes), biosensors and remote sensor devices are covered with emphasis on selection of methods and practical applications in environmental monitoring. Database management, data analysis, statistical treatment of data. Development of optimum monitoring strategy, scheduling, sampling frequency. The course includes laboratory exercises.

ENVE823	UNIT OPERATION: MASS TRANSFER	2	2	3	ENVE811

This course introduces the student to basic principles of mass transfer operations and their applications in the chemical industry, such as diffusion, absorption, extraction, distillation, evaporation, drying, fluidization, size reduction, and mechanical separations. Description of the equipment used for the above operations, is also dealt with.

MATH732	NUMERICAL METHODS AND ANALYSIS	2	2	3	MATH722
This course demonstrates critical knowledge and understanding of specialist theories, principles and concepts of the study of numerical approximations and errors, numerical solutions of non-linear equations, interpolation and curve fittings, numerical differentiation and integration. The course also covers analysis of accuracy of numerical differentiation and integration methods and solution of initial value problems using Euler Method. Analysis of accuracy of Euler's method. The course also includes laboratory components that make use of MATLAB as a tool in solving problems in Numerical Analysis.					
ENVE824	AIR POLLUTION AND PREVENTION	3	0	3	ENVE721
This course introduces the fundamentals of air pollution, with a consideration of the background and historical perspective, and a commentary on current air quality policies and standards. The course also considers the health impacts of air pollution. The course discusses the major approaches for air pollution modeling and demonstrates the features and use of the most widely used commercial and freely available air quality models. Theory, principles, and practices related to the control of particulate emissions, Mechanical separations, Cost, and design of control systems. Micrometeorology, air dispersion; combustion fundamentals; pollutant formation mechanism and control technologies; abatement of volatile organic compounds using incineration techniques; Particulate and aerosol abatement technology; particle technology, log-normal distribution; settling chamber, cyclone, electrostatic precipitator, bag filter.					
ENVE825	UNIT OPERATION: PHYSICAL AND CHEMICAL TREATMENT	2	2	3	ENVE722
This course serves as the unit operations course for physical and chemical treatment of water and wastewater. Fundamental concepts of physical-chemical processes that affect water quality in natural and engineered environmental systems. Focus is on developing a qualitative understanding of mechanisms as well as quantitative tools to describe, predict, and control the behavior of physical-chemical processes. Topics include reactor hydraulics and reaction kinetics, gas transfer, adsorption, particle characteristics, flocculation, gravitational separations, filtration, membranes, and disinfection.					
ENVE831	AIR QUALITY ENGINEERING	3	0	3	ENVE824
Problems and methodologies for studies of environmental management, with an emphasis on air pollution. Key topics include source of pollutants; focusing on combustion chemistry for a hydrocarbon fuel; behavior of gaseous and particulate pollutants in the atmosphere, including the role of meteorology and the use of dispersion equations; effect of pollutants on human health and global climate; and procedures by which air pollution standards are developed and enforced by regulatory agencies. Statistical treatment of data is included at several places in the course.					
ENVE832	SOIL ENGINEERING	3	0	3	ENVE821
Soil Engineering introduces basic knowledge of the fundamental concepts of soil behaviour and gives an introduction into general geotechnical engineering. The course describes the relationship between soils and its geological origins and demonstrates the significance of the particles size distribution and mineralogy of the soil on its engineering behaviour. The effects of the compaction process on the engineering properties of soil are discussed and methods are developed to allow students to design fills. The course explains the principle involved in the flow of water through soils, including the methods of					

analysis and the use of these methods to estimate water pressures and flows in a variety of differing engineering situations. The course discusses the shear strength of soils and develops methods for applying this knowledge in the analysis of bearing pressure for foundations and in the estimation of earth pressures behind earth retaining structures. Methods of analysis of the consolidation of soils are discussed and analytical methods are developed to estimate ground movements due to the consolidation of the soil.

ENVE833	ENVIRONMENTAL ENGINEERING LAWS AND REGULATIONS	3	0	3	ENVE722

This course is an overview of environmental law and its development, legal and administrative structures for their implementation from the international, regional and national perspectives, focusing on basic pollution laws relating to air, water, waste, hazardous substance and noise, nature conservation laws and laws governing environmental impact assessment, Bahraini laws and the laws of selected countries, application of policy issues in environmental management and the political economy of environmental regulations.

ENVE834	ENVIRONMENTAL QUALITY SYSTEMS ENGINEERING	3	0	3	ENVE722

This course deals with the introduction to engineering aspects of environmental quality control. Quality parameters, criteria, and standards for water and wastewater. Elementary analysis pertaining to the modeling of pollutant reaction in natural systems and introduction to the design of unit processes for wastewater treatment will be included.

ENVE835	ENVE UNIT OPERATION: BIOLOGICAL TREATMENT	2	2	3	SCIE723

This course covers the theory and application of biological processes used in the engineered treatment of waste streams, with an emphasis on municipal and industrial wastewaters and biosolids. Fundamental concepts of biological processes that are important in natural and engineered environmental systems, especially those affecting water quality. Incorporates fundamentals of microbiology into a quantifiable engineering context to describe, predict, and control behavior of environmental biological systems. Topics include the stoichiometry, energetics, and kinetics of microbial reactions, suspended and biofilm processes, carbon and nutrient cycling, and bioremediation applications.

ENVE836	TECHNOPRENEURSHIP	3	0	3	ENGG722

The course deals with the study of entrepreneurship in the IT industry by applying the core theories and principles of entrepreneurship and management in IT business. The course covers types of entrepreneurships, legal factors related to the project like Business act, company act, technology act and Industrial act, developing a business plan by integrating business proposal writing skill, software skills, innovation and creativity skills. It also covers advanced level topics like risk management, configuration management and quality management.

ENVE837	METHODS OF RESEARCH WITH INFERENTIAL STATISTICS	3	0	3	MATH622
This course involves the development and analysis of experimental design. Students will also be introduced to some of the methods of statistical analysis frequently used in the environmental field such as two-way ANOVA, cluster analysis, multiple regression, population estimation models.					
ENVE838	PROJECT AND ENGINEERING MANAGEMENT (RISK ANALYSIS)	3	0	3	ENGG722
Introduction to techniques of risk-benefit analysis as applied to water resources and environmental engineering. Techniques of multi-objective water resource planning. Engineering political interfaces; consideration of political bargaining and decision-making and study of comprehensive application of risk analysis techniques for environmental control and protection purposes.					
ENVE839	ENGINEERING HYDROLOGY	3	0	3	ENVE821
This course is about learning both the concepts and physical principles of water flow as well as the techniques that can be used to solve hydrologic problems. In practice, hydrologists have to quantify rates at which water is exchanged between the atmosphere, the ground, and the ocean, and this often involves manipulating data and solving sets of equations. It's fairly easy to lose sight of the conceptual part of the problem once you focus on techniques. Thus, one of the goals of this course is to give you a balanced view of hydrology -- one that includes a description of the physical processes plus a coherent presentation of the theories and techniques that are used in practice. The class is structured around the hydrologic cycle, which you can picture as a set of linked processes that cycle water between the ocean, atmosphere, and land surface.					
ENVE840	OIL AND GAS TECHNOLOGY 1	3	0	3	ENVE821
This course integrates core theories of process overview in oil and gas technology. Students will be provided with detailed knowledge and understanding of various main processes involved in the oil and gas exploration and provided detailed insight on various utility systems and their working principles used in oil and gas technology. The course also covers topics on the maintenance of oil and gas wells.					
ENVE841	ENVIRONMENTAL PLANNING AND DESIGN	3	0	3	ENVE831
This course in Urban and Environmental Planning balances professional planning skills with a liberal education emphasizing interdisciplinary study. The scope of the planner's work encompasses present and future urban and environmental concerns, including such diverse issues as environmental impact, quality of life, and the public and private costs of development. Planners work in the public and private sectors in urban and rural areas. Public sector planners work for all levels of government, formulating plans to redevelop or rehabilitate downtowns and neighborhoods, develop land aesthetically and profitably, and regulate private development to protect public interests.					
ENVE842	INDUSTRIAL ATTACHMENT	0	12	6	4TH Year Standing
This 6-unit course is a practicum course where the students are exposed to an actual work environment. The students are required to complete 240 hours of on-site training. They are sent to work environments					

under the supervision of a practicum professor. Moreover, at the end of the course, individual students submit a final report and a performance evaluation made by the on-site supervisor.

ENVE843	ENVIRONMENTAL ENGINEERING DESIGN PROJECT A	3	0	3	ENVE838

This course provides the senior engineering student with meaningful problem analysis and design experience. The project and its documentation must illustrate the fundamental elements of the design process: establishment of objectives and criteria, synthesis, analysis, testing, and evaluation. The project report must address realistic constraints including economic factors, safety, aesthetics, ethics, and social impacts.

ENVE844	WASTEWATER ENGINEERING	3	0	3	ENVE835

This course focuses on the concept, theory, design, and operation of urban water supply systems. Emphasis will be placed upon a fundamental understanding of commonly used water collection and treatment technologies. Major sections of the course cover water cycle, water consumption and demand, water collection, storage and transportation, drinking water quality, conventional surface water treatment unit operations and processes, advanced water treatment technologies, water stabilization and corrosion control, urban water distribution and transmission, water reclamation and total water management. The course aims to introduce to students the basic concept of water resources engineering and the knowledge of urban water supply. At the end of this course, students who fulfill the requirement of the course will be able to present the principles and theories behind the common water collection and treatment technologies and to conduct conceptual design of freshwater collection systems, common surface water treatment processes and urban water distribution systems.

ENVE845	OIL AND GAS TECHNOLOGY 2	3	0	3	ENVE840

This course integrates advanced theories of process overview in oil and gas technology. Students will be provided with the detailed knowledge and understanding on various main process involved in the oil and gas exploration and also provides detailed understanding of the oil and gas life cycle, the midstream and downstream aspects of the oil and gas industry such as, topsides facilities, refinery operations, gas processing, product transportation as well as economy aspects and environmental issues.

ENVE846	ENVIRONMENTAL IMPACT ASSESSMENT	3	0	3	ENVE834

The course covers the three primary processes of a quality system include: (1) core processes, their outputs, and the identification of significant environmental aspects and impacts, (2) key supporting processes, such as those for maintaining awareness of legal requirements, ensuring competency of employees, providing infrastructure, communicating quality system information, and monitoring and evaluating environmental performance, (3) management system supporting processes, such as document control, record control, and internal auditing.

ENVE847	ENVIRONMENTAL ENGINEERING DESIGN PROJECT B	3	0	3	ENVE834

Continuation of Environmental Engineering Design Project A by individuals or teams with submission of final reports and oral presentations.

ENVE848	RENEWABLE ENERGY	2	2	3	ENVE834
This course will provide students with the fundamentals, design tools, and state-of-the-art alternative energy technologies. The course is broken into two parts: the first part discusses alternative energy technologies such as wind, hydro, geothermal, ocean thermal energy conversion, and economics of alternative energy; the second part of the course deals with solar energy fundamentals and design/performance evaluation of solar collectors, passive and active applications of solar energy, thermal and electric energy storage, and alternative fuel technologies for transportation and power technologies.					
ENVE849	CLIMATE AND GLOBAL WARMING	2	2	3	ENVE834
Climate change and global warming caused by human activity has become one of the most significant environmental, social and economic threats that we have faced. This course presents the science of global climate change and global warming. Emphasis is placed on scientific principles responsible for climate changes, observed evidence of global climate change and global warming, and future climate change. Course topics include climate system, greenhouse effect, El Nino, atmospheric and ocean circulation, Earth's past and present climate, climate models, future climate projection, and climate change impacts.					
ENVE850	REMOTE SENSING	2	2	3	ENVE834
This course emphasizes the understanding of the aerospace remote sensing foundations and the use of remote sensor data and image interpretation and processing techniques for environmental and urban applications. Specifically, the course will cover concepts and foundations of remote sensing, aerial photography and photogrammetry, visual image interpretation, characteristics of various sensing systems and an introduction to digital image processing techniques.					
ENVE851	HAZARDOUS WASTE MANAGEMENT AND REMEDIATION	2	2	3	ENVE834
This course includes hazardous waste management issues, programs, environmental regulations, handling of hazardous wastes, risk assessment, characterization, storage, disposal, and site remediation processes and remedial alternatives and implementation. It also covers management, planning, legal and engineering aspects of liquid and solid hazardous waste treatment and disposal.					
ENVE852	INTRODUCTION TO GIS	2	2	3	ENVE834
This course introduces the concepts and components of a geographic information system (GIS). It also teaches the essential skills of operating a functional GIS through the use of ArcGIS software package. By completing this course, students will understand the operational processes of spatial data acquisition, editing and QA/QC, metadata development, geodatabase design, spatial query and display, spatial analysis and modeling, preliminary GIS application development, cartographic mapping and dynamic visualization, and GIS implementation basics. Students will also be exposed to Google Earth and common open-source GIS tools, as well as the basic concepts of remote sensing and Global Positioning System (GPS).					

ENVE853	ADVANCED TOPICS IN ENVIRONMENTAL ENGINEERING	2	2	3	ENVE834
Any important, relevant topic that is not covered in the given technical elective lists. Topics may be varied subject to students' interest and availability of faculty staff.					