

 University of Technology Bahrain	Doc. No.	QR-AAD-01
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1. Teaching Institution	University of Technology Bahrain
2. University Department	College of Engineering
3. Programme Title	Bachelor of Science in Informatics Engineering (BSIE)
4. Title of Final Award	Bachelor of Science in Informatics Engineering (BSIE)
5. Mode of Attendance	Actual classroom learning interactive
6. Delivery Mode	On-campus (Traditional Learning)
7. National Qualification Framework Level and Credit	NQF Level 8 612 NQF Credits (204 ACS Credits)
8. Accreditation	ABET-EAC
9. Other external influences	Local External Influences/References Ministry of Education (MOE), Higher Education Council (HEC) Education and Training Quality Authority (BQA) International External Influences/References Accreditation Board for Engineering and Technology (ABET)
10. Date of production/revision of this specification	September 2023

11. Aims of the Programme

The Bachelor of Science in Informatics Engineering (BSIE) is an engineering programme which combines computer technology with engineering concepts. It is an interdisciplinary scientific area focusing on the application of advanced computing, information and communication technologies to engineering. It covers the design and development of intelligent engineered products and processes enabled by the integration of computers, control systems and software engineering technologies.

The objectives of the Informatics Engineering programme are to produce graduates who will be able:

1. Pursue careers in Informatics Engineering or related fields towards the improvement of engineering practice.
2. Engage in lifelong learning toward completion of advanced/continuing education or other learning opportunities.
3. Demonstrate professional success through strengthened networks and/or positions of increasing social responsibility.

12. Programme Intended Learning Outcomes

At the completing 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

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4. Recognize 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, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies

Teaching and Learning Methods

1. Constructive Method: Students are required to 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. Teachers implement differentiated learning, authentic assessment practices and incorporate technologies to improve individual learning experiences. It includes simulations, in-course projects, digital content, group discussions and reflections. This method strives to improve achievement by consciously developing students' 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. Students develop cognitive skills like critical thinking and problem solving by working on questions, problems, or scenarios and formulating creative solutions. The teachers use structured, guided or open inquiry to facilitate learning. As a process, students 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.
3. Collaborative Method. Students are divided into small groups to learn something together and capitalize on one's other resources and skills, evaluating one another's 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. By engaging students to hands on experience which attempts to apply theories and knowledge learned in the classroom to real-world situations. This includes team challenges, simulations, internships, capstone projects, and other extracurricular activities.

Assessment Methods

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

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13. Programme Structure

BACHELOR OF SCIENCE IN INFORMATICS ENGINEERING (BSIE) CURRICULUM PLAN EFFECTIVE AY2022-2023

FOUNDATION COURSES

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PREREQUISITE(S)
ENGL500	English Foundation Course	12	0	0	
MATH500	Remedial Mathematics	3	0	0	

FIRST YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
ARAB600	Arabic Language	3	0	3	
CHEM611	General Chemistry	2	2	3	
IENF611	Introduction to Computing	2	2	3	
ENGL611	English Communication Skills 1	3	0	3	
EUTH500	Euthenics	1	0	0	
MATH631	Calculus 1	5	0	5	
TOTAL				17	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF621	Computer Programming	2	2	3	IENF611
ENGL621	English Communication Skills 2	3	0	3	ENGL611
HIST600	History of Bahrain and GCC Region	3	0	3	
MATH711	Calculus 2	5	0	5	MATH631
HUMR600	Human Rights	3	0	3	
TOTAL				17	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF631	Advanced Programming	2	2	3	IENF621
ENGL631	Speech and Oral Communication	2	2	3	ENGL621
SCIE631	Biology	2	2	3	
MATH621	Probability and Statistics	3	0	3	MATH631
PHYS631	University Physics 1	2	2	3	MATH631

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ENVS711	Environmental Science	3	0	3	
TOTAL				18	

SECOND YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF711	Data Structures and Algorithm	2	2	3	IENF631
ENGL711	Technical Writing	3	0	3	ENGL621
ENGG711	Engineering Drawing	2	2	3	
MATH722	Advanced Mathematics	3	0	3	MATH711
MATH622	Discrete Mathematics	3	0	3	MATH631
PHYS711	University Physics 2	2	2	3	PHYS631, MATH711
TOTAL				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
ENGG721	Electric Circuit Theory 1	2	2	3	PHYS711
IENF721	Principles of Communications	2	2	3	PHYS631
IENF722	Database Systems	2	2	3	IENF711
IENF723	Introduction to Data Science	2	2	3	IENF711
MATH731	Multivariate Calculus	2	2	3	MATH711
PHYS722	University Physics 3	2	2	3	PHYS711
TOTAL				18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
ENGG734	Signals and Systems	2	2	3	ENGG721
ENGG733	Engineering Economy	3	0	3	MATH621
ENGG731	Electronics 1	2	2	3	ENGG721
ENGG732	Electric Circuit Theory 2	2	2	3	ENGG721
MATH732	Numerical Methods and Analysis	2	2	3	MATH722
MATH733	Linear Algebra	2	2	3	MATH731
TOTAL				18	

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THIRD YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
ENGG813	Digital Logic Design	2	2	3	ENGG731
IENF811	Computer Networks 1	2	2	3	IENF721
ENGG812	Electronics 2	2	2	3	ENGG731
IENF812	Artificial Intelligence	2	2	3	IENF723
ENGG811	Electromagnetics	3	0	3	ENGG732
MATH821	Optimization Methods	3	0	3	MATH732
TOTAL				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF821	Computer Networks 2	2	2	3	IENF811
IENF822	Advanced Digital Logic Design	2	2	3	ENGG813
IENF823	Computer Organization and Architecture	2	2	3	ENGG813
IENF824	Power Electronics	2	2	3	ENGG812
ENGG821	Control Systems	2	2	3	ENGG734
ENGG831	Engineering and Project Management	3	0	3	ENGG733
TOTAL				18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF831	Computer Networks 3	2	2	3	IENF821
IENF832	Operating System	2	2	3	IENF722
IENF833	Machine Vision	2	2	3	IENF812
IENF834	Systems Analysis and Design	2	2	3	IENF722
IENF835	Cloud Computing	2	2	3	IENF821
ENGG842	Safety Engineering	2	0	2	IENF824
TOAL				17	

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FOURTH YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF841	Digital Systems Design using HDL	2	2	3	IENF822
IENF842	Wireless Communication Systems	2	2	3	IENF821
ENGG841	Technopreneurship	3	0	3	ENGG831
IENF843	Enterprise Networking	2	2	3	IENF821
IENF844	Microcontroller and Embedded Systems	2	2	3	IENF823
ENGG851	Professional Ethics and Engineering Laws	3	0	3	ENGG831
TOTAL				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF851	Software Engineering	2	2	3	IENF832
IENF852	Major Elective 1	2	2	3	IENF821
IENF853	Major Elective 2	2	2	3	IENF832
IENF854	Major Elective 3	2	2	3	ENGG821
IENF855	Informatics Engineering Design Project A	0	6	3	Completion of 162 Credit Hours
IENF856	Robot Kinematics, Dynamics and Control	2	2	3	ENGG821
TOTAL				18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF861	Industrial Attachment	0	6	6	IENF844
IENF862	Informatics Engineering Design Project B	0	6	3	IENF855
TOTAL				9	
Grand Total				204	

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ELECTIVE COURSES

MAJOR ELECTIVE 1

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF852A	Cryptographic Systems	2	2	3	IENF821
IENF852B	Network Security	2	2	3	IENF821
IENF852C	Ethical Hacking	2	2	3	IENF821

MAJOR ELECTIVE 2

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF853A	Microprocessor Systems	2	2	3	IENF832
IENF853B	Data Mining	2	2	3	IENF832
IENF853C	Parallel and Distributed Computing	2	2	3	IENF832

MAJOR ELECTIVE 3

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
IENF854A	Special Topics in Computer Engineering	2	2	3	ENGG821
IENF854B	Digital Control Systems	2	2	3	ENGG821
IENF854C	Industrial Control Systems Design	2	2	3	ENGG821

14. Awards and Credits

Degree/ Certificate Awarded	Bachelor of Science in Informatics Engineering
Total Units for Degree	204
Total Trimesters Completed	12 trimesters

15. Admission Criteria

Admission to University of Technology Bahrain (UTB) is open to all qualified applicants.

For First Year Undergraduate Applicant

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 (if needed)
4. Submission of all required documents stated in the Admissions Policy.

To be admitted to BSIE 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:

<i>Subtest Component for Bahraini, KSA, Kuwait, Qatar, Yemen, Switzerland, USA, and Ecuador Qualification</i>		<i>BSIE Studies</i>
Mathematics	Science/ Technical/General Track	At least 70% or C
	Commercial Track	At least 80% or B
Science		60
English		At least 80 or B

<i>Subtest Component for Other Qualification (Indian, Pakistan, and West African)</i>		<i>BSIE Studies</i>
Mathematics	Science/ Technical/General Track	At least 51 or C1
	Commercial Track	At least 71 or B1
Science		60
English		At least 71 or B1

For the undergraduate applicant who did not meet the minimum required secondary school grades in Mathematics, Science and English or its equivalent, his/her admissions depend on the following criteria:

Programme	Secondary School Grade	Placement Test in English (OOPT)	Remarks
All Programmes	60-79 % grade in English	Score $\geq$ 55 %	No need for remediation in English
		Score < 55 %	Remediation in English
BSIE	For Commercial Track: Score 60-79% in Math For Scientific and technical Track: Score 60-69% in Math	NA	Remediation in Math
	For Science score <60%	NA	Tutorial class in general sciences
All Programmes	CGPA < 60% for Bahraini and KSA CGPA < 41% for Indian and Pakistan	NA	Will be subjected to 5% admission rule of UTB (As explained under note)

• 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.

• 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.

• Secondary Grade in Math

A qualified applicant for Engineering, Computer Science or Business Informatics 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. 5% is subject to strict evaluation by the dean and the applicant's score in the OOPT and the secondary school grades.

• **Secondary Grade in Science**

A qualified applicant for Engineering, Computer Science or Business Informatics programme who has a secondary grade score in science of lower than 60% has to take tutorial classes in general science before taking any university-level science course.

For Undergraduate Transfer Student Applicants

Application Requirements:

1. 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.

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 if courses applied for crediting are equivalent to the courses where credit will be transferred. 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. Career Pathways

The BSIE graduates can pursue a career as network engineer, control engineer, network analyst/administrator, production engineer, systems developer, computer/software engineer, sales engineer, technical instructor/trainer. In addition, the programme can lead graduates for postgraduate degrees in engineering.

18.	BSIE CURRICULUM SKILLS MAPPING									
Year / Level	Course Code	Course Title	Core (C) or Option (O)	Programme Learning Outcomes						
				1	2	3	4	5	6	7
Year 1 1st Tri	ARAB600	Arabic Language	(C)				✓			
	CHEM611	General Chemistry	(C)	✓				✓	✓	✓
	IENF611	Introduction to Computing	(C)	✓	✓			✓	✓	✓
	ENGL611	English Communication Skills 1	(C)			✓				
	EUTH500	Euthenics	(C)							
	MATH631	Calculus 1	(C)	✓						
Year 1 2nd Tri	IENF621	Computer Programming	(C)	✓	✓		✓	✓	✓	
	ENGL621	English Communication Skills 2	(C)			✓				
	HIST600	History of Bahrain and GCC Region	(C)				✓			
	MATH711	Calculus 2	(C)	✓						
	HUMR600	Human Rights	(C)				✓			
Year 1 3rd Tri	IENF631	Advanced Programming	(C)	✓	✓		✓	✓	✓	
	ENGL631	Speech and Oral Communication	(C)			✓				
	SCIE631	Biology	(C)	✓				✓	✓	
	MATH621	Probability and Statistics	(C)	✓						
	PHYS631	University Physics 1	(C)	✓				✓	✓	
	ENVS711	Environmental Science	(C)				✓			✓

18.	BSIE CURRICULUM SKILLS MAPPING									
Year / Level	Course Code	Course Title	Core (C) or Option (O)	Programme Learning Outcomes						
				1	2	3	4	5	6	7
Year 2 1st Tri	MATH722	Advanced Mathematics	(C)	✓					✓	✓
	ENGL711	Technical Writing	(C)			✓				
	ENGG711	Engineering Drawing	(C)	✓						
	MATH622	Discrete Mathematics	(C)	✓					✓	✓
	IENF711	Data Structures & Algorithm	(C)	✓	✓		✓	✓	✓	
	PHYS711	University Physics 2	(C)	✓				✓	✓	✓
Year 2 2nd Tri	IENF721	Principles of Communications	(C)	✓	✓			✓	✓	
	ENGG721	Electric Circuit Theory 1	(C)	✓	✓	✓		✓	✓	
	MATH731	Multivariate Calculus	(C)	✓					✓	✓
	IENF723	Introduction to Data Science	(C)	✓	✓			✓	✓	✓
	IENF722	Database Systems	(C)	✓	✓			✓	✓	✓
	PHYS722	University Physics 3	(C)	✓				✓	✓	✓
Year 2 3rd Tri	ENGG731	Electronics 1	(C)	✓	✓	✓		✓	✓	
	ENGG734	Signals and Systems	(C)					✓	✓	
	ENGG732	Electric Circuit Theory 2	(C)	✓	✓	✓		✓	✓	✓
	ENGG733	Engineering Economy	(C)	✓			✓			
	MATH733	Linear Algebra	(C)	✓				✓	✓	✓
	MATH732	Numerical Methods and Analysis	(C)	✓					✓	✓
Year 3 1st Tri	ENGG813	Digital Logic Design	(C)	✓	✓	✓		✓	✓	✓
	IENF811	Computer Networks 1	(C)	✓	✓	✓	✓	✓		
	ENGG812	Electronics 2	(C)	✓	✓	✓		✓	✓	✓
	IENF812	Artificial Intelligence	(C)	✓	✓			✓	✓	✓
	ENGG811	Electromagnetics	(C)	✓						✓
	MATH821	Optimization Methods		✓						
Year 3 2nd	IENF821	Computer Networks 2	(C)	✓	✓			✓	✓	✓
	IENF822	Advanced Digital Logic Design	(C)	✓	✓			✓	✓	✓

18.	BSIE CURRICULUM SKILLS MAPPING									
Year / Level	Course Code	Course Title	Core (C) or Option (O)	Programme Learning Outcomes						
				1	2	3	4	5	6	7
Tri	ENGG831	Engineering Project Management	(C)	✓			✓	✓		
	ENGG821	Control Systems	(C)	✓	✓				✓	✓
	IENF823	Computer Organization and Architecture	(C)	✓	✓	✓	✓	✓	✓	✓
	IENF824	Power Electronics	(C)	✓	✓	✓		✓	✓	✓
Year 3 3rd Tri	IENF831	Computer Networks 3	(C)	✓	✓			✓	✓	✓
	ENGG842	Safety Engineering	(C)				✓			
	IENF832	Operating Systems	(C)	✓	✓			✓	✓	✓
	IENF833	Machine Vision	(C)	✓	✓	✓		✓	✓	✓
	IENF834	Systems Analysis and Design	(C)	✓	✓			✓	✓	✓
	IENF835	Cloud Computing	(C)	✓	✓			✓	✓	✓
Year 4 1st Tri	IENF841	Digital Systems Design using HDL	(C)	✓	✓	✓			✓	✓
	IENF842	Wireless Communication Systems	(C)	✓	✓	✓		✓	✓	✓
	ENGG841	Technopreneurship	(C)			✓	✓	✓	✓	
	IENF843	Enterprise Networking	(C)	✓	✓		✓	✓	✓	✓
	IENF844	Microcontroller and Embedded Systems	(C)	✓	✓	✓		✓	✓	✓
	ENGG851	Professional Ethics and Engineering Laws	(C)				✓			
Year 4 2nd Tri	IENF856	Robot Kinematics, Dynamics and Control	(C)	✓	✓	✓		✓	✓	✓
	IENF852	Major Elective 1	(O)	✓	✓			✓	✓	✓
	IENF853	Major Elective 2	(O)	✓	✓			✓	✓	✓
	IENF854	Major Elective 3	(O)	✓	✓			✓	✓	✓
	IENF851	Software Engineering	(C)	✓	✓			✓	✓	✓
	IENF855	Informatics Engineering Design Project A	(C)	✓	✓	✓	✓	✓		✓

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Year / Level	Course Code	Course Title	Core (C) or Option (O)	Programme Learning Outcomes						
				1	2	3	4	5	6	7
Year 4 3rd Tri	IENF861	Industrial Attachment	(C)	✓	✓	✓	✓	✓		✓
	IENF862	Informatics Engineering Design Project B	(C)	✓	✓	✓	✓	✓	✓	✓

BACHELOR OF SCIENCE IN INFORMATICS ENGINEERING (BSIE)
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	12	0	0	
ENGL500 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 (preintermediate) 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.					
CHEM611	General Chemistry	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.					

IENTF611	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, algorithm and flowchart development. The laboratory delivers practices in Microsoft 365 Apps, configuring web browsers security, configuring E-mail security, configuring OS security.					
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.					
MATH631	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 measurement, 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.					
EUTH500	Euthenics	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 role 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.					
ARAB600	Arabic Language	3	0	3	
يركز مقرر ARAB600 على دراسة أساسيات اللغة العربية كقراءة وتحليل و نقد وبيان خصائص النصوص المطلوبة التي تتناول مختلف الأجناس الأدبية نثراً وشعراً. كما يركز هذا المقرر على دراسة وفهم وتطبيق القواعد النحوية والأساليب الصرفية الأساسية في اللغة العربية مع مراعاة مهارات الكتابة الإملائية الصحيحة. 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.					
HUMR600	Human Rights	3	0	3	
تناول هذا المقرر تمكين الطالب وجعله قادراً على معرفة الخلفية التاريخية لحقوق الإنسان، المفاهيم والاصول الفلسفية والرؤيا الإسلامية لحقوق الانسان كما يتناول بالعرض والتحليل مصادر حقوق الإنسان كالإعلان العالمي لحقوق الإنسان، والعهد الدولي الخاص بالحقوق المدنية والسياسية والعهد الدولي الخاص بالحقوق الاقتصادية والاجتماعية والثقافية والوثائق الدولية الأخرى ذات الصلة بحقوق الإنسان ماورد فيها من الحقوق والتمييز بينها. كما يتناول بالمقاربة ذاتها ما ورد في الوثائق الوطنية مثل دستور مملكة البحرين والميثاق الوطني وكيفية					

تطبيقها. ويُمكن الطلبة من مهارات تحليل و تفسير ونقد التطبيقات و التجاوزات فضلا عن القدرة على التحليل و التواصل و عرض مسائل حقوق الإنسان بمختلف الوسائل.

This course makes the students able to know the background, main concepts of Human Rights and the philosophical thoughts and Islamic view which contribute in modern Human Rights. It makes them able to analyze what is mentioned in different kinds of Human Rights sources 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.

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.

MATH631**Calculus 1****5****0****5**

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 emphases on practical speaking experiences and analysis of audience psychology, which are deemed applicable in diverse speech situations.

HIST600**History of Bahrain and GCC Region****3****0****3**

يتناول المقرر **HIST600** دراسة تاريخ مملكة البحرين ومنطقة الخليج العربي ويُظهر تعداد للأحداث الهامة في البحرين ومنطقة الخليج العربي وأثرها على الوضع الراهن ، ويغطي الأهمية الاستراتيجية والمكانية للبحرين للبحرين بدءاً من الحضارات القديمة و مروراً إلى العهد الاسلامي، والاحتلال البرتغالي، وصراع القوى في القرن السابع عشر، وصعود قبيلة العتوب، والبحرين تحت الحماية البريطانية و إبرام المعاهدات مع بريطانيا، وانسحاب القوات البريطانية من البحرين والخليج ، ويتناول وصف الاماكن والشخصيات والتطورات التاريخية والانجازات في البحرين في عهد حكام البحرين، والبعد العربي والاسلامي في تكوين هوية البحرين ، الانضمام لمجلس التعاون الخليجي ، وتاريخ دول الخليج العربي (دول مجلس التعاون الخليجي)، ومع نهاية الكورس يكون الطالب قادر على تحليل الجذور التاريخية للبحرين لتكوين الهوية الوطنية ، والتمتع بمقدرة الاتصال الشفهي والكتابي والعمل بشكل منتج وفعال ضمن فريق واحد.

s 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.

MATH711	Calculus 2	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 its 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.					
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.					
IENF621	Computer Programming	2	2	3	IENF611
This course covers detailed knowledge in problem solving and algorithm development, with emphases 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 the problems. It includes a discussion of an overview of the Java language syntax, including packages, classes, methods, variables, conditional statements, control flow and Arrays. The laboratory focuses on the implementation of the programming theories and concepts in Java programming language.					
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.

ENVS711**Environmental Science****3****0****3**

This course is an introduction to Environmental Science focusing on interrelationships of the natural world, sustainable development with environmental, economic and societal dimensions, energy transformations, ecological process and relationships, energy flow through systems, human population growth, water processes and cycles, impacts of climate change, “green” electronic processes, energy utilization and efficiency, conventional and alternative energy sources, present day agricultural practices, biodiversity and threats by human activity, and conservation issues.

MATH622**Discrete Mathematics****3****0****3****MATH631**

This course introduces fundamental concepts and techniques in set theory in preparation for its many applications in Informatics Engineering. Topics include logic, proofs, sets, relations, functions, graphs and trees. It simplifies and evaluates basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.

ENGG711**Engineering Drawing****2****2****3****ENGG711**

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.

PHYS711**University Physics 2****2****2****3****PHYS631, 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.

IENF711**Data Structures & Algorithm****2****2****3****IENF631**

This course covers advanced problem solving in linear and non-linear data structures and their implementation. Topics include arrays, sorting and searching techniques, stacks, queues, linked lists, trees and hash tables. In addition, it covers various strategies for choosing appropriate structures according to the system requirements. The laboratory portion covers the implementation of linear data structures such as stacks and queues and nonlinear data structures like trees and graphs using array and linked list.

ENGG721**Electric Circuit Theory 1****2****2****3****PHYS711, MATH711**

The course deals with the study of core theories, principles and concepts for analysis of DC networks through the application of basic laws and network theorems. It covers the inter relationship between the parameters of DC circuits, critical analysis of complex circuits excited by DC voltages and current sources through basic circuit laws - KVL and KCL and structured methods and theorems like nodal analysis, Mesh analysis, superposition, Maximum power transfer & Millman’s theorem.

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.					
MATH621	Probability and Statistics	3	0	3	MATH622
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)					
IENF631	Advanced Programming	2	2	3	IENF621
This course covers object-oriented techniques using modern fourth generation language. Topics include inheritance, method overloading, overriding, polymorphism, packages, exception handling, multithreading, file operations and Event driven programming using swing components. The laboratory focuses on the implementation of programming theories and concepts in Java programming language.					
PHYS722	University Physics 3	2	2	3	PHYS711
This course is designed to explore the concepts of heat and thermodynamics, waves and optics, relativity, molecular, atomic, and nuclear physics using the concepts of mechanics, electricity and magnetism, vectors, and other mathematical models and their advanced application, such as the application of the laws of thermodynamics, light and electromagnetic waves, Einstein's special theory of relativity, Planck's Quantum theory, de Broglie's waves, Heisenberg's Uncertainty Principle, Dirac's electron theory, Hund's Rule, and atomic models from Thompson's to Quantum Mechanical, as well as nuclear models.					
ENGG731	Electronics 1	2	2	3	ENGG721
This course discusses core theories, principles and concepts of semiconductors, PN junction diode, other types of diodes & bipolar junction transistor (BJT). It also relates to fundamental diode circuit's application and design; rectifiers, limiters, doublers, Zener diode characteristics and applications, and special purpose diodes. The course evaluates the operation of bipolar junction transistor (BJT), and its characteristic and parameters; BJT as amplifier and switch, DC analysis and different biasing methods.					
IENF721	Principles of Communication	2	2	3	PHYS631
The course deals with the This course deals on review on signals and systems, Introduction to communications systems. Amplitude modulation techniques (AM-LC, DSBSC, SSB, VSB and FDM). Frequency modulation techniques (NBFM, WBFM). Sampling, PCM, Pulse Modulation (PAM, PCM, TDM). Introduction to digital communication and digital modulations (MSK, FSK, PSK, etc).					
ENGG732	Electric Circuit Theory 2	2	2	3	ENGG721
This course deals with core theories, principles and concepts of the topics of sinusoidal voltage and current on RLC circuits, vector algebra and its application to AC circuit analysis, sinusoidal and non- sinusoidal single phase system, and three phase systems. It also covers reactance, impedance, resonance, power in AC circuits, power factor correction and impedance network. The course evaluates the theorems which includes Kirchhoff's laws, Mesh, Superposition, Nodal Analysis, Thevenin's, Norton, and Maximum power transfer.					

ENGG733	Engineering Economy	3	0	3	MATH631
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.					
MATH731	Multivariate Calculus	2	2	3	MATH711
This is the third part of the course in calculus focused on vector and multi-variable calculus. Topics associated with the course demonstrate advanced knowledge and understanding of the following: vectors and vector operators, calculus of functions of several variables including partial differentiation and multiple integrals, Lagrange multipliers, applications of partial differentiation, line integrals, Green's theorem, Stoke's theorem, and Divergence theorem. The course also includes laboratory components that make use of MATLAB as tool in solving problems in Multivariate Calculus.					
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 tool in solving problems in Numerical Analysis.					
IENF722	Database Systems	2	2	3	IENF711
This course provides advanced core theories and practical skills in databases and database management systems with information technology applications. The theoretical knowledge covers Database Environment, Relational Model, Database Operations, Structured Query Language, Entity Relationship Model and Normalization. It exposes the student to the advanced concepts and techniques in database and development as well provides a foundation for research in databases. The laboratory practices the Data Definition Language (DDL) Commands, Data Manipulation Language (DML) Commands, Data Query Language (DQL) Commands, Transaction Control Language (TCL) Commands, SQL Built-in Functions, Constraints, Joins, Group By Command, Subqueries and Database Objects.					
IENF723	Introduction to Data Science	2	2	3	IENF711
This course utilizes several open-source tools to address big data challenges, taking an "Open" or technology-neutral approach. It covers concepts, and techniques needed to deal with various aspects of data science practice, including data collection, cleansing, mangling, and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, machine learning algorithms, evaluation, effective communication and Data Visualization.					
ENGG813	Digital Logic Design	2	2	3	ENGG731
This course provides critical knowledge and understanding of designing digital logic circuits. It covers number systems and conversion, Boolean algebra, algebraic manipulation, applications of Boolean algebra, Karnaugh maps, multi-level gate circuits, multiplexers, decoders, comparators, latches and flip-flops, registers, counters					

and introduction to HDL. Through laboratory and in-course project, the students will creatively implement complex applications of digital logic circuits.

IENF811	Computer Networks 1	2	2	3	IENF721
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This course integrates the core theories, principles, concepts, structure, functions and components of the Internet and computer networks. The OSI and TCP/IP models are used to examine the services and the associated protocols in each layer. The concepts and structure of IPv4 addressing and subnetting, its application, operation and implementation to networks are discussed. The laboratory part makes use of a range of approaches including the Packet Tracer and GNS3 to allow students to implement static routing and critically analyze network requirements, issues and/or problems. These simulators will allow the students to build networks, use appropriate devices and IP addresses, and perform configurations.

ENGG812	Electronics 2	2	2	3	ENGG731
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This is an advanced course in electronics which deals with concept, analysis and design of electronic circuits using linear and integrated devices. In this course include AC and DC analysis, principles and concepts of frequency response of BJT amplifiers and further extends the study to multistage amplifier and various FET. The other topics include study and critical analysis of Operational Amplifier, its application, Feedback topologies & explore NE555 Timer and its applications.

ENGG734	Signals and Systems	2	2	3	ENGG721
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This course covers the study of the core topics, principles of signal and noise, modulation and demodulation. It also discusses the specialist theories and principles of application of signals in the field of amplitude modulation and frequency modulation covering modulation index, bandwidth, side frequencies, power distribution and calculation, modulator circuits. Moreover, spectral analysis, bandwidth, efficiency, various transforms and filters will also be covered.

ENGG811	Electromagnetics	3	0	3	ENGG732
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This course covers core topics on electric and magnetic fields that emphasize fundamental concepts and applications in electromagnetic. Topics include vector analysis, coulomb's law and electrical field intensity, electric flux density, gauss's law, magnetic flux, magnetic flux density, magnetic potential, time varying fields, concepts and applications of Maxwell equations, electromagnetic waves and propagation, plane waves and reflection, waveguides, and Antennas.

MATH733	Linear Algebra	2	2	3	MATH731
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This course use 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 use as a mathematical software and solutions to a variety of mathematical problems are determined.

IENF812	Artificial Intelligence	2	2	3	IENF723
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This course covers advanced theories and state-of-the-art techniques of artificial intelligence. Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on computers.

The AI is to make a computer that can learn, plan, and solve problems autonomously. The topic includes building blocks and components of artificial intelligence, learning about concepts like algorithms, machine learning, and neural networks. The laboratory focuses on training the students with building models using various artificial intelligence algorithms.

IENF821	Computer Networks 2	2	2	3	IENF811
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This course provides an in-depth and advanced discussion of routing technology. It integrates the core theories, concepts, functions and operations of a router including the principles and applications of routing protocols. Topics include router components and configuration; Unicast and Multicast routing protocols: RIPv1, RIPv2, EIGRP, OSPF and BGP; VLSM and IPv6. The students make use of a range of approaches including the Packet Tracer, GNS3 and the actual network devices in the laboratory in performing advanced and complex network configurations using the different routing protocols and in the critical analysis of network requirements, issues and/or problems.

IENF822	Advanced Digital Logic Design	2	2	3	ENGG813
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This course provides critical knowledge and understanding of analysis and design of synchronous and asynchronous sequential circuits based on core theories, principles and concepts of combinational circuit and Hardware Description Language(HDL) Topics covered include design of Decimal Adder, Binary multiplier, multiplexer ,Demultiplexer, encoder ,decoder, design of sequential circuits like registers and counters, HDL models for combinational and sequential circuits , combinational PLDs and introduction to FPGA .

ENGG821	Control Systems	2	2	3	ENGG734
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The course deals with the study of the concepts of control systems. It covers also the discussion of the mechanical and electrical modeling using conventional differential equations, reduction rules applied to block-diagram of linear control systems and signal flow graph. Laplace and Inverse Laplace Transformations. Discussion of time-domain response of first and second order control systems, steady-state errors, Routh-Hurwitz Criterion for stability, root locus method, frequency response (bode diagram and polar plot), Nyquist stability criterion, and compensatory design techniques. MATLAB is used for analyzing and simulating control systems.

IENF823	Computer Organization and Architecture	2	2	3	ENGG813
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This course covers computer arithmetic, computer function, components and their interconnections. It also includes discussion on memory hierarchy and organization; I/O peripherals and interfacing; instruction sets based on 8086 microprocessor, addressing modes and access; processor structure and functions including interrupts, RISC and CISC. The laboratory uses Assembly Language Program software which is a microprocessor emulator with editor, assembler and debugger.

IENF824	Power Electronics	2	2	3	ENGG812
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This course covers the power electronics semiconductor switches, Thyristor, Triac, GTO and advanced types of power transistor. Triggering devices: UJT, DIAC, and PUT. Types of power conversion: single phase and three phase uncontrolled and controlled rectifiers and their performance. AC voltage regulator, inverters single phase and three phase with PWM techniques.

IENTF831	Computer Networks 3	2	2	3	IENTF821
This course provides critical knowledge and understanding of the theoretical and practical approaches about technologies and protocols in the design and implementation of switched networks. Students learn about advanced and complex hierarchical network design model. The course tackles switch functionalities and implementations using VLAN, VTP, STP, Inter-VLAN, Link- Aggregation Protocol and WLAN. The laboratory sessions provide practical and actual approaches to learning advanced and complex switch configurations and troubleshooting using the different protocols mentioned.					
ENGG831	Engineering and Project Management	3	0	3	ENGG733
This course provides critical knowledge and understanding of project management and the essential tools needed to deliver successful projects on time and on budget from the standpoint of the manager, who must skillfully organize, plan, implement and control non-routine activities to achieve schedule, budget and performance activities. Topics include: project life cycles, principles and concepts of strategic management process in project selection and organization, planning, budgeting and scheduling systems. It also covers planning and control methods such as PERT- CPM , Gantt Charts, earned value techniques, project audits, and risk management to critically evaluate various project management situations.					
IENTF832	Operating Systems	2	2	3	IENTF823
This course provides advanced and detailed information about the components and functionalities of operating systems. Topics include operating system structures, process management & scheduling, memory management, virtual memory management, deadlocks, file systems, directory structure, protection, security and distributed operating systems. In laboratory, the various operating system commands are illustrated using DOS, Cygwin tools and the implementation of scheduling, memory management and page replacement algorithms using Java.					
MATH821	Optimization Methods	3	0	3	MATH732
The course takes a unified view of optimization and covers the main areas of application of core optimization algorithms. The topics include linear optimization, robust optimization, network flows, dynamic optimization and non-linear optimization.					
IENTF833	Machine Vision	2	2	3	IENTF812
This course discusses core theories, principles and concepts of machine vision devices and techniques and also learns about computer vision systems and digital image processing. It also relate to fundamental issues and techniques of computer vision and image processing. Emphasis will be on physical, mathematical, image-processing, pattern recognition, and feature extraction aspects of vision. The course will have a proper Lab activity to enable students to understand the breadth and depth of the lecturing materials. The main topics that will be as: Machine vision concepts, Image acquisition, Lighting, Image formation, Image conversion, Image processing and analysis. Image enhancement, Edge detection and Image segmentation.					
IENTF834	Systems Analysis and Design	2	2	3	IENTF722
The course describes the concepts and methods used in the analysis and design of computer-based information systems. It includes discussions of typical computer systems life cycles, system requirements and specification, feasibility concerns, system design, fault tolerance, people and interface issues, compliance with ethical and					

legal standards and quality issues. The laboratory focuses on training the students with hands-on experience on using UML using various tools.

IENF835**Cloud Computing****3****3****3****IENF821**

This course covers advanced concepts required to build a cloud infrastructure based on a cloud computing reference model. The reference model includes five fundamental layers, namely, physical, virtual, control, and service and three cross-layer functions, namely business continuity, security, and service management for building a Cloud infrastructure. Furthermore, Topics included Cloud infrastructure reference model, resource management, programming models, application models, system characterizations, and implementations, deployment of Cloud computing systems. Moreover, this course takes an open approach to describe concepts and technologies.

ENGG841**Technopreneurship****3****0****3****ENGG831**

The course deals with the study of entrepreneurship in IT industry by applying the core theories and principles of entrepreneurship and management in IT business. The course covers types of entrepreneurship, 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.

IENF841**Digital Systems Design using HDL****2****2****3****IENF822**

This course covers topics in the advanced design and analysis of digital circuits with VHDL. The primary goal is to provide in depth understanding of logic and system design, synthesis, and optimization. The course enables students to apply their knowledge for the design of digital hardware systems with corresponding memory modules and reconfigurable programmable logic devices (PLDs and FPGAs). Verilog HDL will be used for simulation and synthesis of the lab exercises and final design project.

IENF842**Wireless Communication Systems****2****2****3****IENF821**

This course aims to develop the core knowledge of communications theories and their applications in digital communications. The course covers the structure of the digital communication systems, analog modulation technique, digital modulation techniques, probability of error in digital communication system, multiple access techniques, channels and source encoding, mobile communication systems.

IENF843**Enterprise Networking****2****2****3****IENF831**

This course provides critical knowledge and understanding of the theoretical and practical approaches to WAN technologies and network services required by converged applications in complex enterprise networks. Topics include Point-to-Point (PPP) concepts, Frame Relay, Access Control Lists (ACLs), Network Security and Monitoring, VPN technology, IP addressing services and Quality of Service. The laboratory sessions provide practical and actual approaches to learning advanced and complex implementation and configuration of WAN technologies and protocols as mentioned.

IENF844**Microcontroller and Embedded Systems****2****2****3****IENF823**

This course provides critical knowledge and understanding of microcontroller-based systems design, development and implementation. It includes embedded system types, microcontroller architecture, programming, digital and analog I/O interfacing, task scheduling, interrupt and timers management, and

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communication interfaces. Through laboratory and in-course project, the students will creatively implement complex applications of microcontroller-based systems.					
ENGG842	Safety Engineering	2	0	2	IENF824
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.					
ENGG851	Professional Ethics and Engineering Laws	3	0	3	ENGG831
This course covers topics in the core theories and concepts of ethics, law, contracts, intellectual property, the responsible engineer, moral thinking, risk/safety/liability, employer responsibilities, product liability, and environmental responsibilities. The course deals with 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. It also provides a historical perspective on society's environmental concerns, and discusses environmental statutes, our regulatory system, approaches to preventing and mitigating environmental problems, and the elements of an effective environmental management system.					
IENF851	Software Engineering	2	2	3	IENF841
This course demonstrates the advanced concepts in software design paradigms; identify software requirements and use Computer Aided Software Engineering in designing and developing efficient software application. The course covers an in-depth survey of software process, project management, project metrics, project scheduling, risk management, software testing and software quality assurance. The course also covers the implementation of the proposed system using structured programming, software reviews, software testing techniques and strategies, software maintenance. The laboratory focuses on providing students with hands-on experience using different tools to design a mini project such as Microsoft Visio, Visual Studio and others.					
IENF855	Informatics Engineering Design Project A	0	6	3	Completion of 162 Credit hours
This is the first of two courses in Informatics Engineering Design sequence which prepares students for engineering practice through a culminating major design experience or capstone based on the knowledge and skills acquired in foundation and core courses and incorporating appropriate engineering standards (IEEE, ISO) as an integral part and with due consideration of multiple realistic constraints tradeoffs. This is a group supervised design project in which students analyze, specify, design, construct, evaluate and adapt physical computing in various applications such as in smart environments and embedded systems. They also incorporate design standards and make decision as a result of multiple design tradeoff/constraints (economics, environmental, social, political, ethical, health and safety, manufacturability, and sustainability) analysis and evaluation as part of the design process.					
IENF861	Industrial Attachment	0	6	6	IENF844
This course is the practicum course where the students are exposed to actual work environment. The students are required to complete 240 hours of on-site training. They are sent to work environments under the					

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

IENF862	Informatics Engineering Design Project B	0	6	3	IENF855
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This course is a continuation of Informatics Engineering Design A which enables students to design a system, component, or process to meet desired needs within realistic constraints through a culminating major design experience or capstone based on the knowledge and skills acquired in foundation and core courses and incorporating appropriate engineering standards (IEEE, ISO) as an integral part and with due consideration of multiple realistic constraints tradeoffs.

This is a group supervised design project in which students analyze, specify, design, construct, evaluate and adapt physical computing applications in smart environments and embedded systems. They also incorporate design standards and make decisions as a result of multiple design tradeoff/constraints (economics, environmental, social, political, ethical, health and safety, manufacturability, and sustainability) analysis and evaluation as part of the design process.

IENF852A	Cryptographic Systems	2	2	3	IENF821
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This course emphasizes systematic authentication to follow the advancement of cryptographic techniques and security protocols. It exposes the various protocols and cryptographic functions to estimate the strength of security using advanced encryption/decryption algorithm. It also discusses security enhancement techniques such as symmetric and asymmetric encryption and key exchange management. In addition, it investigates the various complex security issues and develops a high-level security mechanism in contemporary networked computer systems. The laboratory portion implements the complex level conversion of plain text to cipher text using RSA algorithm, Diffie-Hellman-Key-Exchange algorithm and Stream Cipher Technique to embed security in Java. In addition, it identifies suitable cryptographic algorithms for a given problem to resolve security issues.

IENF852B	Network Security	2	2	3	IENF821
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This course discusses the essentials and underlying of network security with emphasis on secure network administration principles. It includes compliance and operational security, threats and vulnerabilities, controls and protection methods, and encryption and authentication technologies in order to attain secured working environment. In laboratory part, Cisco networking simulation tools are used to simulate, configure and apply Cisco compatible authentication protocols on the simulated networks.

IENF852C	Ethical Hacking	2	2	3	IENF821
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This course is designed to provide concepts and practices of cybersecurity with expert coverage of essential topics required for entry-level cybersecurity certifications. It covers the four distinct challenges: securing the infrastructure, securing devices, securing local networks, and securing the perimeter and the concepts and practices to overcome these challenges. This course covers each challenge individually for greater depth of information, with real-world scenarios that show what vulnerabilities look like in everyday computing scenarios. It will explore the various means that an intruder has available to gain access to computer resources. We will investigate weaknesses by discussing the theoretical background behind, and whenever possible, actually performing the attack. We will then discuss methods to prevent/reduce the vulnerability.

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IENTF853A	Microprocessor Systems	2	2	3	IENTF832
This course demonstrates advanced knowledge and understanding of the functions Microprocessor architecture and organization, type of buffering techniques data representation, addressing modes and instruction sets. Memory, PPI, PIT and serial Interfacing with Address decoding, I/O mapping and subsystem, interrupts and other peripheral controller and Programming. practice of the design of a microprocessor system based on Intel 86xxx microprocessor.					
IENTF853B	Data Mining	2	2	3	IENTF832
This course provides an in-depth study of the field of statistical analysis and data mining as it relates to real-world applications. The course explores how the advanced and complex data mining interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. It covers the field of data mining and includes the topics data preprocessing, predictive modeling, model evaluation techniques, clustering, classification, and association analysis and anomaly detection. The Laboratory session discusses Weka and R data mining tools and using that perform preprocessing, classifications and clustering based on real word data sets.					
IENTF853C	Parallel and Distributed Computing	2	2	3	IENTF832
This course provides an overview of distributed and parallel systems, with special emphasis on cloud-based implementations. Topics include distributed systems and models, computer clusters for scalable parallel computing, virtual machines, cloud platform architecture, service-oriented architecture, grid computing, and peer-to-peer computing. The Laboratory exercises will be used to demonstrate various aspects of parallel and distributed computing using MS MPI					
IENTF854A	Robot Kinematics, Dynamics and Control	2	2	3	ENGG821
This course facilitates the core learning and understanding of robot manipulators for students to understand complex design and applications of robots in industrial application. Successful completion allows students to formulate the kinematics and dynamic modelling of robotic manipulators consisting of a serial chain of rigid bodies and to implement control algorithms with sensory feedback during the lab sessions. Students will gain specialist skills in dealing with complex control architecture and manipulator structure typical to new-generation robots					
IENTF854B	Digital Control Systems	2	2	3	ENGG821
The course deals with core theories, principles and concepts of Digital Control Systems, z-plane Analysis, Sampling and Reconstruction, Open-Loop and closed-loop Discrete-Time Systems, Time-Response Characteristics, Stability Analysis of Discrete-Time Control Systems, Design of Discrete-Time Controllers, Pole-Placement and Observer Design, and Linear Quadratic Optimal Control. MATLAB is used for analyzing and simulating digital control systems.					
IENTF854C	Industrial Control Systems Design	2	2	3	ENGG821
The course deals with core concepts and theories of the hardware and software of Programmable logic controllers. This course also deals with programming, connecting, and testing Programmable Logic Controllers (PLCs) for control of complex industrial/commercial processes. It covers sensor interfacing, application of PLCs in some specific Industrial process, and utilization of a hand-held programmer in troubleshooting PLCs. Hands-					

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on simulation is conducted for the students to understand the critical PLC implementation process in industry using advanced tools such as Festo PLC modules and CodeSys software.

SCIE400	Biology	2	2	3	
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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.