1. Teaching Institution	University of Technology Bahrain (UTB)
2. University Department	College of Engineering (COE)
3. Programme Title	Bachelor of Science in Mechatronics Engineering (BSME)
4. Title of Final Award	Bachelor of Science in Mechatronics Engineering (BSME)
5. Attendance Mode	Actual classroom learning-interactive (Full-time)
6. Delivery Mode	On-campus (Traditional Learning)
7. National Qualification Framework Level and Credit	NQF Level 8 540 NQF Credits (180 ACS Credits)
8. Accreditation	ABET, Engineering Accreditation Commission (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	April 2026

11. Aims of the Programme

The Bachelor of Science in Mechatronics Engineering is an interdisciplinary engineering programme that combines knowledge and skills in mechanical, electrical, and computer control systems, as well as engineering design and management. The core courses include mechanical design, sensors and actuators, control theory, robotics, automation and embedded systems. Students on this programme will learn to combine different systems to develop a solution for a real-world problem, or design and build an intelligent, programmable and integrated system.

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

1. Pursue careers in Mechatronics 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; and
3. Demonstrate professional success through strengthened networks and/or positions of increasing social responsibility.

12. Programme Intended Learning Outcomes

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. 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. Active and Engaged Learning. Students are required to attend the sessions regularly. Students learn by doing, making, writing, designing, creating, and solving. Active participation of the students during discussion is expected. Learning is an active process, and as such, students must engage with the course materials, i.e. reading the textbook and other assigned advanced readings.
2. Problem-based learning. After each topic, sample problems will be provided to students. Working in groups, students identify what they already know, what they need to know, and how and where to access new information that may lead to resolution of the problem.
3. Project Based Learning: Students engage in learning essential knowledge and skills through an extended, student-driven inquiry process structured around complex, authentic questions and carefully designed projects and tasks.
4. Collaborative learning. Students will be divided into groups with at least three (3) members and each group will be provided with problems or projects that they will work on together to search for understanding, meaning, or solutions Each group is expected to work together in solving particular engineering problems, discuss the algorithm of the problems, and present the solution in class.
5. Discovery-based learning. During laboratory hours, students will be given experiments to work in groups where they can apply the theories and principles learned. This is an opportunity to have hands-on experience and maximize their learning through actual simulation.

Assessment Methods

Assessment is done independently for each course. Variety of assessment tools will be used to assess achievement of intended learning outcomes including but not limited to: written examinations, assignments, case analysis, Laboratory reports, Simulations, presentations, projects and capstone.

13. Programme Structure

BACHELOR OF SCIENCE IN MECHATRONICS ENGINEERING (BSME)

CURRICULUM PLAN EFFECTIVE AY 2026-2027

Foundation Courses

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	

FIRST YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
ARAB600	Arabic Language	3	0	3	
CHEM611	General Chemistry	2	2	3	
ENGG610	Introduction to Engineering	2	2	3	
ENGL611	English Communication Skills 1	3	0	3	
EUTH500	Euthenics	1	0	0	
SCIE631	Biology	2	2	3	
MATH633	Calculus 1	3	0	3	
		TOTAL		18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
CSCI601	Programming for Engineers	2	2	3	
ENGL621	English Communication Skills 2	3	0	3	ENGL611
HIST600	History of Bahrain and GCC Region	3	0	3	
MATH713	Calculus 2	3	0	3	MATH633
PHYS631	University Physics 1	2	2	3	MATH633
ENGG711	Engineering Drawing	2	2	3	
		TOTAL		18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
CSCI627	Computer Programming 1	2	2	3	CSCI601
ENGG724	Thermodynamics	3	0	3	PHYS631
HUMR600	Human Rights	3	0	3	
MATH621	Probability and Statistics	3	0	3	
ENVS711	Environmental Science	3	0	3	SCIE631

PHYS711	University Physics 2	2	2	3	PHYS631, MATH713
		TOTAL		18	

SECOND YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
ENGG726	Heat Transfer	3	0	3	ENGG724
ENGL712	Technical Communication	3	0	3	ENGL621
ENGG720	Engineering Materials	3	0	3	CHEM611
MATH731	Multivariate Calculus	2	2	3	MATH713
MATH722	Advanced Mathematics	2	2	3	MATH713
ENGG721	Electric Circuit Theory 1	2	2	3	PHYS711
		TOTAL		18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
PHYS722	University Physics 3	2	2	3	PHYS711
ENGG725	Engineering Mechanics	3	0	3	PHYS631
ENGG731	Electronics 1	2	2	3	ENGG721
ENGG732	Electric Circuit Theory 2	2	2	3	ENGG721
MATH732	Numerical Methods and Analysis	2	2	3	MATH731
MATH733	Linear Algebra	2	2	3	MATH731
		TOTAL		18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
ENGG733	Engineering Economy	3	0	3	MATH621
ENGG815	Fluid Mechanics	2	2	3	ENGG725
ENGG812	Electronics 2	2	2	3	ENGG731
ENGG816	Electrical Machines	3	0	3	ENGG732
ENGG813	Digital Logic Design	2	2	3	ENGG731
MATH734	Differential Equations	3	0	3	MATH731
		TOTAL		18	

THIRD YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
MECH812	Hydraulics and Electro-hydraulics	2	2	3	ENGG815, ENGG813
IENF811	Computer Networks 1	2	2	3	PHYS631
MECH811	Pneumatics and Electro-Pneumatics	2	2	3	ENGG815, ENGG813
ENGG821	Control Systems	2	2	3	ENGG732
MATH821	Optimization Methods	3	0	3	MATH732
ENGG822	Safety Engineering	3	0	3	ENGG733
		TOTAL		18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
MECH821	Intelligent Control	2	2	3	ENGG813,MATH821
MECH822	Modern Control System	2	2	3	ENGG821
ENGG831	Engineering and Project Management	3	0	3	ENGG733
MECH823	Programmable Logic Controllers	2	2	3	MECH811
MECH824	Power Electronics	2	2	3	ENGG812
MECH825	Embedded Systems	2	2	3	ENGG813
		TOTAL		18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
MECH831	Machine Vision	2	2	3	MECH822
MECH832	Process Instrumentation and Control	2	2	3	ENGG726, ENGG821
MECH833	Robotics	2	2	3	MECH824, MECH822
ENTR801	Technopreneurship	3	0	3	ENGG831
ENGG851	Professional Ethics and Engineering Laws	3	0	3	ENGG831
See Lists Below	Major Elective 1	2	2	3	MECH825
		TOTAL		18	

FOURTH YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
See Lists Below	Major Elective 2	2	2	3	MECH825
See Lists Below	Major Elective 3	3	0	3	MECH833
MECH841	Industrial Automation	2	2	3	MECH823
MECH842	Mechatronics Engineering Design Project A	0	6	3	On Completion of 144 credit units
		TOTAL		12	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
MECH843	Industrial Attachment	0	3	3	MECH833
MECH844	Mechatronics Engineering Design Project B	3	0	3	MECH842
		TOTAL		6	

ELECTIVE COURSES

MAJOR ELECTIVE 1 (Student must choose 1 course)

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PRE-REQUISITES
MECH851	Artificial Intelligence	2	2	3	MECH825
MECH862	System Modeling and Simulation	2	2	3	MECH825
MECH853	Digital Control Systems	2	2	3	MECH825

MAJOR ELECTIVE 2 *(Student must choose 1 course)*

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE/S
MECH861	Wireless Communications	2	2	3	MECH825
MECH866	Digital Signal Processing	2	2	3	MECH825
IENF821	Computer Networks 2	2	2	3	MECH825

MAJOR ELECTIVE 3 *(Student must choose 1 course)*

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE/S
MECH863	Special Topics in Mechatronics Engineering	3	0	3	MECH833
MECH864	Smart Manufacturing	3	0	3	MECH833
MECH865	Power Plant	2	2	3	MECH833

14. Awards and Credits	
Degree/ Certificate Awarded	Bachelor of Science in Mechatronics Engineering
Total Units for Degree	180
Total Trimesters Completed	11

15. Admission Criteria

Admissions Criteria for Undergraduate Students

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. Online 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 any undergraduate programme, the applicant must satisfy the minimum secondary school grades or its equivalent without the need to take the 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***
		BSME
Mathematics	Science/ Technical/General Track	At least 70% or C
	Commercial Track	At least 80% or B
	Literature and Islamic Tracks	At least 80% or B
Science	-	60
English	-	At least 80 or B

*This is applicable to Bahraini and similarly equivalent qualification

1. Private school

Private school graduates with English as their medium of instruction are eligible for the exemption from the foundation program.

Subtest Component for Other Qualification (Indian, Pakistan, and West African)		***Programme***
		BSME
Mathematics	Science/ Technical/General Track	At least 51 or C1
	Commercial Track	At least 71 or B1
	Literature and Islamic Tracks	At least 71 or B1
Science	-	60
English	-	At least 71 or B1

*Note: Science component is subject to the evaluation of the Dean.

For the undergraduate applicant who did not meet the minimum required secondary school grades in Mathematics 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 ≥ 51 %	No need for Foundation Course in English
		Score < 51 %	Foundation Course in English
BSME	For Commercial Track: Score 50-79% in Math. For Scientific, General, and technical Track: Score 50-69% in Math.	N/A	Foundation Course in Math
	For Science score <60%	N/A	Tutorial class in general sciences
All Programmes	CGPA <60% for Bahraini and KSA. CGPA <41% for Indian and Pakistan.	N/A	Will be subjected to 5% admission rule of UTB (As explained under note)

*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 51 or above, applicant will not take remediation course in English. However, if the result is lower than 51, applicant will take remediation course in English.

b. Private school

Private school graduates with English as their medium of instruction are eligible for the exemption from the foundation program (English Foundation).

c. IELTS/TOEFL

Applicants who submit official IELTS or TOEFL certificates issued by accredited examination centers, with a minimum score of 450 on the TOEFL (paper-based), 131 on the TOEFL (computer-based), or 5.0 on the IELTS, are exempted from taking the required English Placement Test.

In addition, applicants who obtain an IELTS score of 5.5 or higher or a TOEFL score that meets the equivalent standard may qualify for English course exemptions based on their results. This policy

recognizes academic achievement by allowing eligible students to be exempted from enrolling in introductory English courses upon admission.

IELTS/TOEFL Scores	Exemption
Qualified applicants with 5.5 IELTS scores or TOEFL: 496 (paper-based) or 169 (computer based)	Satisfying this requirement means to be exempted from taking: ENGL401/ENGL611 (English Communication Skills 1)
Qualified applicants with 6.0 IELTS scores or TOEFL: 546 (paper-based) or 211 (computer based)	Satisfying this requirement means to be exempted from taking: ENGL401/ENGL611 and ENGL402/ENGL621 (English Communication Skills 1 and 2)

d. Secondary Grade in Math

A qualified applicant for BSME, BSEnE, BSIT, BSBI, and BSAF programmes who has a secondary grade score in Math of 50-79% for commercial track and 50-69% for scientific and technical tracks and lower than 60% for the BSIB programme must take the remediation course in Math. All qualified applicants for BSCS and BSIE programmes coming from the literature and Islamic tracks must take the remediation course in Math.

e. Secondary Grade in Science

A qualified applicant for BSME, BSIE, BSEnE, BSCS, BSIT, BSBI, and BSAF programmes who has a secondary grade score in science of lower than 60% must take tutorial class in general science before taking any university-level science course.

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.

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.

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 course in English and Mathematics, the basis for evaluation whether remedial course in English and mathematics is required or not is the subject scores 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. Career Pathways

The BSME graduates can pursue a career as automation engineer, production engineer, instrumentation & control engineer, production/manufacturing supervisor, PLC programmer, design engineer, vocational instructor/trainer, laboratory engineer, maintenance supervisor, or sales engineer. In addition, the programme can lead graduates for postgraduate degrees in engineering.

18. BSME (AY2025-2026) CURRICULUM SKILLS MAPPING

Year / Level	Course Code	Course Title	Core (C) or Option (O)	Programme Learning Outcomes / Student Outcomes						
				SO1	SO2	SO3	SO4	SO5	SO6	SO7
Year 1 1st Tri	ARAB600	Arabic Language	(C)			/				
	CHEM611	General Chemistry	(C)	/		/		/	/	
	ENGG610	Introduction to Engineering	(C)	/	/	/		/	/	
	ENGL611	English Communication Skills 1	(C)			/				
	EUTH500	Euthenics	(C)							
	SCIE631	Biology	(C)	/				/	/	
	MATH633	Calculus 1	(C)	/						
Year 1 2nd Tri	CSCI601	Programming for Engineers	(C)	/	/	/		/	/	
	ENGL621	English Communication Skills 2	(C)			/				
	HIST600	History of Bahrain and GCC Region	(C)				/			
	MATH713	Calculus 2	(C)	/						
	PHYS631	University Physics 1	(C)	/		/		/	/	
	ENGG711	Engineering Drawing	(C)	/		/		/		/
Year 1 3rd Tri	CSCI627	Computer Programming 1	(C)	/				/	/	
	ENGG724	Thermodynamics	(C)	/						/
	HUMR600	Human Rights	(C)				/			
	MATH621	Probability and Statistics	(C)	/						
	ENVS711	Environmental Science	(C)				/			
	PHYS711	University Physics 2	(C)	/		/		/	/	
Year 2 1st Tri	ENGG726	Heat Transfer	(C)	/						/
	ENGL712	Technical Communication	(C)			/				
	ENGG720	Engineering Materials	(C)	/						
	MATH731	Multivariate Calculus	(C)	/				/	/	/
	MATH722	Advanced Mathematics	(C)	/				/	/	/

18. BSME (AY2025-2026) CURRICULUM SKILLS MAPPING

Year / Level	Course Code	Course Title	Core (C) or Option (O)	Programme Learning Outcomes / Student Outcomes						
				SO1	SO2	SO3	SO4	SO5	SO6	SO7
	ENGG721	Electric Circuit Theory 1	(C)	/	/	/		/	/	
Year 2 2nd Tri	PHYS722	University Physics 3	(C)	/		/		/	/	
	ENGG725	Engineering Mechanics	(C)	/						
	ENGG731	Electronics 1	(C)	/	/	/		/	/	
	ENGG732	Electric Circuit Theory 2	(C)	/	/	/		/	/	/
	MATH732	Numerical Methods and Analysis	(C)	/				/	/	/
	MATH733	Linear Algebra	(C)	/				/	/	/
Year 2 3rd Tri	ENGG733	Engineering Economy	(C)	/			/			
	ENGG815	Fluid Mechanics	(C)	/						/
	ENGG812	Electronics 2	(C)	/	/	/		/	/	/
	ENGG816	Electrical Machines	(C)	/						/
	ENGG813	Digital Logic Design	(C)	/	/	/		/	/	
	MATH734	Differential Equation	(C)	/		/				
Year 3 1st Tri	MECH812	Hydraulics and Electro-hydraulic	(C)	/	/	/		/	/	/
	IENF811	Computer Networks 1	(C)	/	/	/		/	/	/
	MECH811	Pneumatics and Electro-Pneumatics	(C)	/	/	/		/	/	/
	ENGG821	Control Systems	(C)	/	/				/	/
	MATH821	Optimization Methods	(C)	/						
	ENGG822	Safety Engineering	(C)				/			
Year 3 2nd Tri	MECH821	Intelligent Control	(C)	/	/	/		/	/	/
	MECH822	Modern Control System	(C)	/	/	/		/	/	/
	ENGG831	Engineering and Project Management	(C)	/			/	/		
	MECH823	Programmable Logic Controllers	(C)	/	/	/		/	/	/
	MECH824	Power Electronics	(C)	/	/	/		/	/	/
	MECH825	Embedded Systems		/	/	/		/	/	/
Year 3 3rd Tri	MECH831	Machine Vision	(C)	/	/	/		/	/	/
	MECH832	Process Instrumentation and Control	(C)	/	/	/		/	/	/
	MECH833	Robotics	(C)	/	/	/		/	/	/

18. BSME (AY2025-2026) CURRICULUM SKILLS MAPPING

Year / Level	Course Code	Course Title	Core (C) or Option (O)	Programme Learning Outcomes / Student Outcomes						
				SO1	SO2	SO3	SO4	SO5	SO6	SO7
	ENTR801	Technopreneurship	(C)	/	/	/			/	/
	ENGG851	Professional Ethics and Engineering Laws	(C)				/			
	MECH851	Major Elective 1: Artificial Intelligence	(O)	/	/	/			/	/
	MECH862	Major Elective 1: System Modeling and Simulation	(O)	/	/	/			/	/
	MECH853	Major Elective 1: Digital Control Systems	(O)	/	/	/			/	/
Year 4 1st Tri	MECH861	Major Elective 2: Wireless Communications	(O)	/	/	/		/	/	/
	MECH866	Major Elective 2: Digital Signal Processing	(O)	/	/	/		/	/	/
	IENF821	Computer Network 2	(O)	/	/	/		/	/	/
	MECH863	Major Elective 3: Special Topics in Mechatronics Engineering	(O)	/		/		/		
	MECH864	Major Elective 3: Smart Manufacturing	(O)	/		/		/		
	MECH865	Major Elective 3: Power Plant	(O)	/		/		/		
	MECH841	Industrial Automation	(C)	/	/	/		/	/	/
	MECH842	Mechatronics Engineering Design Project A	(C)	/	/	/	/	/	/	/
Year 4 2nd Tri	MECH843	Industrial Attachment	(C)	/	/	/	/	/		/
	MECH844	Mechatronics Engineering Design Project B	(C)	/	/	/	/	/	/	/

BACHELOROF SCIENCE IN MECHATRONICS ENGINEEING (BSME)

CURRICULUM PLAN EFFECTIVE 2026-2027

COURSES DESCRIPTION

FOUNDATION COURSES

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.					

FIRST YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC HRS	LAB HRS	CREDIT UNITS	PRE-REQUISITE(S)
ARAB600	Arabic Language	3	0	3	
ركز مقرر ARAB600 على دراسة أساسيات اللغة العربية كقراءة وتحليل و نقد وبيان خصائص النصوص المطلوبة التي تتناول مختلف الأجناس الأدبية نثرا وشعرا. كما يركز هذا المقرر على دراسة وفهم وتطبيق القواعد النحوية والأساليب الصرفية الأساسية في اللغة العربية مع مراعاة مهارات الكتابة الإملائية الصحيحة. The ARAB400A/ARAB600 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.					
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.					
ENGG610	Introduction to Engineering	2	2	3	
This course provides an introduction to the fundamental concepts and practices of engineering. It covers the basics of engineering, including the role of engineers, the engineering design process, and common measurement units and techniques. The course also includes a laboratory component focused on practical hands-on experiences with measurements and basic workshop skills like drilling and grinding.					
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.					
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 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.					
SCIE631	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 between explanations based on evidence through inquiry-based laboratory activities to provide insight into scientific method.					
MATH633	Calculus 1	3	0	3	
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.					
			TOTAL	18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE/S
CSCI601	Programming for Engineers	2	2	3	
Fundamental principles, concepts, and methods of programming with emphasis on applications in the physical sciences and engineering. Basic problem solving and programming techniques; fundamental algorithms and data structures; and use of programming logic in solving engineering problems.					

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.					
HIST600	History of Bahrain and GCC Region	3	0	3	
يتناول مقرر **HIST600** دراسة تاريخ مملكة البحرين ومنطقة الخليج العربي ويُظهر تعداد للأحداث الهامة في البحرين ومنطقة الخليج العربي وأثارها على الوضع الراهن ، و يغطي الأهمية الاستراتيجية والمكانية للبحرين للبحرين بدءاً من الحضارات القديمة و مروراً الى العهد الاسلامي، والاحتلال البرتغالي، وصراع القوى في القرن السابع عشر، وصعود قبيلة العتوب، والبحرين تحت الحماية البريطانية وابرام 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. The HIST600 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.					
MATH713	Calculus 2	3	0	3	MATH633
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	MATH633
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.					
ENGG711	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 CAD 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.					
			TOTAL	18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
CSCI627	Computer Programming 1	2	2	3	CSCI601
This is an introductory course designed to equip students with the foundational skills necessary for computer programming. The lecture classes will cover a broad range of topics essential for beginners, such as understanding tokens, variables, data types, and control structures. In addition to that, students will learn how to manage input and output data and string manipulation, providing a strong theoretical foundation for students. In laboratory sessions, students will apply the theoretical concepts learned in lectures using Python. These sessions aim to solidify students' understanding and enable them to confidently apply their programming skills in practical scenarios.					
ENGG724	Thermodynamics	3	0	3	PHYS631
Thermodynamics deals with the study of the properties of the pure substances and their relations to the different processes related to energy concepts, ideal gas laws, work and heat, and steam cycles. It also includes a critical evaluation of various laws and its practical applications of thermodynamic principles in power plants.					
HUMR600	Human Rights	3	0	3	
يتناول هذا المقرر تمكين الطالب و جعله قادرا على معرفة الخلفية التاريخية لحقوق الإنسان، المفاهيم و الاصول الفلسفية و الرؤيا الاسلامية لحقوق الانسان كما يتناول بالعرض و التحليل مصادر حقوق الإنسان كالإعلان العالمي لحقوق الإنسان، و العهد الدولي الخاص بالحقوق المدنية و السياسية و العهد الدولي الخاص بالحقوق الإقتصادية و الإجتماعية و الثقافية و الوثائق الدولية الأخرى ذات الصلة بحقوق الإنسان ماورد فيها من الحقوق و التميز بينها. كما يتناول بالمقاربة ذاتها ما ورد في الوثائق الوطنية مثل دستور مملكة البحرين و الميثاق الوطني و كيفية تطبيقها. و يُمكن 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.					
MATH621	Probability and Statistics	3	0	3	
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)					
ENVS711	Environmental Science	3	0	3	SCIE631
This course is an introduction to environmental science focusing on interrelationships of the natural world, sustainable development with environmental, economic and societal dimensions, energy transformatinos, ecological process and relationships, energy flow through systems, human population growth, water processes and cycles, impacts of climate change, “green” elctronic processes, energy					

utilization and efficiency, conventional and alternative energy sources, present day agriculutural practices, biodiversity and threats by human activity, and conversation issues.					
PHYS711	University Physics 2	2	2	3	PHYS631, MATH713
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.					
		TOTAL	18		

SECOND YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
ENGG726	Heat Transfer	3	0	3	ENGG724
This course focuses on steady state and time-dependent conduction in one- and two-dimensions; forced convection, internal and external flows; heat exchangers; introduction to radiation; elements of thermal system design.					
ENGL712	Technical Communication	3	0	3	ENGL621
This course allows students to gain practical experience and a deeper understanding of the role of technical communication in fostering career readiness and lifelong learning. It helps students develop vital rhetorical skills for creating documents and delivering presentations in the workplace. Moreover, it enables students to present technical information clearly and effectively in professional settings.					
ENGG720	Engineering Materials	3	0	3	CHEM611
This course deals with the study 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.					
MATH731	Multivariate Calculus	2	2	3	MATH713
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.					
MATH722	Advanced Mathematics	2	2	3	MATH713
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.					

ENGG721	Electric Circuit Theory 1	2	2	3	PHYS711
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.					
			TOTAL	18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
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.					
ENGG725	Engineering Mechanics	3	0	3	PHYS631
This course will cover both nondeformable and deformable systems. The section on nondeformable bodies will include topics such as force components, free body diagrams, vectors, resultant force systems, moments of forces, equilibrium of rigid bodies, and the critical analysis of trusses. The section on deformable bodies will explore the relationship between externally applied loads and their internal effects on bodies. It will include the analysis of various stresses, including normal, flexural, shear, and bearing stress					
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, Optoelectronic devices and circuits. 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.					
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.					
MATH732	Numerical Methods and Analysis	2	2	3	MATH731
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.					
MATH733	Linear Algebra	2	2	3	MATH731
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.					
			TOTAL	18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
ENGG733	Engineering Economy	3	0	3	MATH621
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.					
ENGG815	Fluid Mechanics	2	2	3	ENGG725
Fluid Mechanics deals with the study associated with details of the properties of the fluid to adept the necessary Knowledge related to fluid power concepts such as the fluid properties of compressible and incompressible fluids which include Density, viscosity, surface tension, specific gravity, specific weight and bulk modulus and compressibility. The topics covered fluid statics and hydrostatic forces; fluid mechanics fundamentals, including concepts of mass and momentum Integral relations for control volume: Bernoulli, energy and momentum equations. Flow in pipes; laminar and turbulent flow, Reynolds number and Moody chart, laminar and turbulent boundary layer fundamentals.					
ENGG812	Electronics 2	2	2	3	ENGG731
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 amplifier 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.					
ENGG816	Electrical Machines	3	0	3	ENGG732
This course examines the core theory, characteristics, construction operation and application of static and rotating electrical machines. It includes the detailed study and analysis of direct current motors, direct current generators, AC Machines, special machines etc. The course offers a detailed understanding of the application of electromagnetic machines in the field of industry.					
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 and counters, programmable logic devices. Through laboratory and in-course project, the students will creatively implement complex applications of digital logic circuits.					
MATH734	Differential Equations	3	0	3	MATH731
This course provides the students with knowledge and understanding of ordinary differential equations of first order and first degree with applications, second and higher order ordinary linear differential equations with constant coefficients and its applications, simulataneous differential equations, formation of partial differential equations their classification, solution of heat equation, wave equation and its use in modelling important applications in the scientific and engineering fields.					
			TOTAL	18	

THIRD YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
MECH812	Hydraulics and Electro-hydraulics	2	2	3	ENGG815, ENGG813
This course deals with the core concepts and physical principles of hydraulics, circuit symbols and components of a hydraulic and Electro-Hydraulics system. It also covers the study of the components of the power supply, Hydraulic Power Generation, control valves, actuators and accessories, and the extended cylinders. Students will also learn to design and implement hydraulic and electro-hydraulic system for complex industrial applications. students will critically analyze, evaluate and synthesize the Electrical circuit Design including electrical components and memory Circuit, Time lag relays, Pressure Control, Speed control valve. Hands-on simulation on advanced industrial applications related to hydraulics and electro hydraulics is conducted for the students using the Festo hydraulics modules.					
IENF811	Computer Networks 1	2	2	3	PHYS631
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.					
MECH811	Pneumatics and Electro-Pneumatics	2	2	3	ENGG815, ENGG813
This course exposes the student to critical knowledge and technical skills related to industrial pneumatic and electro-pneumatic systems. Areas of study integrates the core theories and concepts of pneumatic and electro-pneumatic systems; interfacing of various actuating and sensing elements; and use of hardware and software to develop complex mechatronics system.					
ENGG821	Control Systems	2	2	3	ENGG732
The course deals with the study of the concepts of control systems. It also discusses mechanical and electrical modeling using conventional differential equations, reduction rules applied to block diagrams of linear control systems, and signal flow graphs. Laplace and Inverse Laplace Transformations. Discussion of the 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 compensator design techniques. MATLAB is used for analyzing and simulating control systems.					
MATH821	Optimization Methods	3	0	3	MATH732
The course takes an advanced and 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.					
ENGG822	Safety Engineering	3	0	3	ENGG733
This course deals with the detailed study the principles of safety engineering and applications of safety principles to industrial and commercial systems. It covers topics concerning safety management, chemical hazards, equipment hazards,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.					
			TOTAL	18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
MECH821	Intelligent Control	2	2	3	ENGG813,MATH821
This course integrates core concepts and theories of Artificial Neural Networks (ANN), Perceptron networks, training methodology, and typical application to linearly separable problems, Fuzzy systems, training methods and implementation of ANN and Fuzzy systems for complex industrial applications. Students will also learn to utilize more advanced tools, features, and training methods in implementing intelligent control system. Higher level software programming will be used for critically analyzing, evaluating, and synthesizing the implemented fuzzy logic and neural networks systems.					
MECH822	Modern Control System	2	2	3	ENGG821
This course deals with details knowledge and understanding of theories for linear systems. This module develops a detailed understanding of the fundamentals of linear systems analysis and design using the state space approach. Topics covered include state space representation of systems; solution of state equations; stability analysis using Lyapunov methods; controllability and observability; linear state feedback design; and state observer. MATLAB is used for analyzing and simulating Linear systems.					
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 based on agreed scope, time and budget from the standpoint of the project manager, who must skillfully initiate, plan, organize, implement and control non-routine activities to successfully complete the projects based on the metrics. Topics include project life cycles, principles, and concepts of strategic management process in project selection and organization, project cost and time estimation. Students will be exposed to the different cost estimation tools as well the use of PERT-CPM and Gantt Charts to monitor progress, in addition to methods in performing project audits, and risk management to critically evaluate various project management situations.					
MECH823	Programmable Logic Controllers	2	2	3	MECH811
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-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.					
MECH824	Power Electronics	2	2	3	ENGG812
This course explores various power semiconductor switches, including power diodes, SCR, Triac, GTO, and advanced power transistors like MOSFET and IGBT. It also delves into triggering devices such as UJT, DIAC, and PUT. Key topics include single-phase and three-phase AC-DC converters, voltage regulators, and single-phase and three-phase DC-AC inverters with PWM techniques. Additionally, the course covers DC-DC converters, specifically boost and buck converters, along with the basics of chopper configurations. Practical applications of power electronics in systems like solar energy and UPS circuits are also included.					
MECH825	Embedded Systems	2	2	3	ENGG813
This course offers three essential components: critical knowledge and understanding of microcontroller-based systems design, development, and implementation; practical exploration of various embedded system types; and creative implementation of complex applications using microcontroller-based systems. The course covers a wide range of topics, including microcontroller architecture, programming, digital and analog I/O interfacing for different components, task scheduling, interrupt and internal timers management, and communication interfaces. Students will have hands-on experience in the laboratory and will undertake an in-course project to apply their knowledge and creativity in implementing sophisticated microcontroller-based system applications.					
	TOTAL			18	

THIRD TRIMESTER

COURSE CODE	**COURSE TITLE**	**LEC Hrs**	**LAB Hrs**	**CREDIT Units**	**PREREQUISITE(S)**
MECH831	Machine Vision	2	2	3	MECH822
This course discusses about 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 activities to enable students 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.					
MECH832	Process Instrumentation and Control	2	2	3	ENGG726, ENGG821
This course deals with the core concepts and theories of industrial process control and the instrumentation used for it. It elaborates various sensors used in process industry and special emphasis is given on measurement sensors such as Pressure transmitter, Ultrasonic sensors, thermistors and proportional valves. Students will learn the working principle, specifications, design and selection aspects used for sensing complex process parameters, along with merits and limitations of each type of sensor.					

The course will also build the detailed knowledge to the participants on working principles of control loop components, control strategies, and PID controller fundamentals including terminology, algorithms and advanced methods. Furthermore, In this course, students will learn how to design, implement, and maintain SCADA programs to effectively monitor and control industrial processes. A special emphasis on real life implementations, case studies and international standards would ensure students to critically analyze, evaluate and synthesize with their day-to-day practice.					
MECH833	Robotics	2	2	3	MECH824, MECH822
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 student 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.					
ENTR801	Technopreneurship	3	0	3	ENGG831
This course provides advanced concepts, facts and ideas of starting a business, working for an entrepreneurial company or working with entrepreneurial firms as an investor or advisor. The course is designed to demonstrate necessary techniques and tools to planning and organizing business and is aimed to integrate the overall dimensions of entrepreneurship, including identifying a winning business opportunity, gathering funding for and launching a business, growing the organization and harvesting the rewards. In particular topics covered different types of entrepreneurships, its importance for economies, business model creation, financial evaluation and financing the start-up.					
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.					
Major Elective 1 (Student Must Choose 1 Course)					
MECH851	Artificial Intelligence **(Elective)**	2	2	3	MECH851
This course provides a detailed understanding on concepts and techniques of artificial intelligence (AI) for mechatronics engineering students. The course covers topics such as machine learning, neural networks, fuzzy logic, expert systems, and their applications in mechatronics systems. Students will learn how to design, implement, and evaluate AI-based solutions for various mechatronics problems.					
MECH862	System Modeling and Simulation **(Elective)**	2	2	3	MECH862
This course examines core theories and principles of engineering system modelling and simulation methods, as well as numerical and computer based solution techniques utilized in industrial and engineering environments. Techniques for finding solutions to these systems include: graphical, algebraic, numerical, state space, simulation and computational processes. Case studies in industry and engineering applications are used to illustrate the techniques and modelling concepts. Examples of simulation and					

analysis methods will be related to the linear and non-linear, deterministic and non-deterministic systems					
MECH853	Digital Control Systems **(Elective)**	2	2	3	MECH853
Introduction to Digital Control, Discrete-Time Systems (Difference equations, The z-transform, z-Transform solution of difference equations, The time response of a discrete-time system, The modified z-transform, The sampling theorem), Modeling of Digital Control Systems, Stability of Digital Control Systems, Digital Control System Design (z-Domain root locus, Digital implementation of analog controller design, Direct z-domain digital controller design, Frequency response design, Direct control design), Discrete-time State-Space Representation, The solution of linear state-space equations, The transfer function matrix, Stability of state-space realizations, Controllability and sterilizability, Observability and detectability, Detectability, State-space realizations, State Feedback Control, Pole placement, State estimation, Observer state feedback, Optimal control, The linear quadratic regulator.					
		TOTAL		18	

FOURTH YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
Major Elective 2 (Student Must Choose 1 Course)					
MECH861	Wireless Communications **(Elective)**	2	2	3	MECH861
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					
MECH866	Digital Signal Processing **(Elective)**	2	2	3	MECH866
The course deals with the detailed study of the core theories, principles and concepts of digital signal processing; discrete convolution; Z-transform; sampled data system; digital filters; discrete Fourier transforms; fast Fourier transforms. DSP Applications. Introduction of 2-D signal (image) processing. This course is designed to provide students with a comprehensive treatment of the important issues in design, implementation and applications of digital signal processing theory and algorithm. Further, computer simulation exercises are intended to familiarize the student with implementation aspects and the application of theoretical knowledge to practical problems.					
IENF821	Computer Network 2 **(Elective)**	2	2	3	IENF821
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.					

Major Elective 3 (Student Must Choose 1 Course)					
MECH863	Special Topics in Mechatronics Engineering **(Elective)**	3	0	3	MECH863
Selected topic in Mechatronics Engineering includes recent advancement in automation and mechatronics which are not included in regular courses.					
MECH864	Smart Manufacturing **(Elective)**	3	0	3	MECH864
The purpose of this course is to equip students with the knowledge and skills needed to meet the demands of the manufacturing workforce of the future. It provides an overview of manufacturing systems from product design to facility planning, processes, production systems, and quality control techniques. The role of smart technologies, like IOT, data analytics, cloud computing and automation in reshaping manufacturing engineering is emphasized.					
MECH865	Power Plant **(Elective)**	3	0	3	MECH865
The course deals with the major systems and components practice related to power plan to generate electrical power such as Boiler, Turbine, Condenser and pumps. The topics covered are: thermodynamic cycles; ranking cycle modified Rankin cycle with re-heater and feed water heater, also steam, gas and combined cycle power plant are covered. This course required the student to integrate all these topics to analyze and design the deferent type of power plant systems and components.					
MECH841	Industrial Automation	2	2	3	MECH823
This course integrates core theories of mechanical design, computer control and electronic components in designing an Industrial automation system. Students will be provided with the detailed knowledge and understanding on various automation strategies, automation layouts, material handling devices used in assembly lines, automated assembly lines and computer integrated manufacturing. It discusses the step by step manner of designing, assembling, and programming a modular station based on the given system requirement. The laboratory uses Codesys software for PLC programming and advanced FESTO educational modules in simulating processes in the modular production system.					
MECH842	Mechatronics Engineering Design Project A	0	6	3	On Completion of 144 credit units
This is the first of two courses in Mechatronics 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.					
			TOTAL	12	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT Units	PREREQUISITE(S)
MECH843	Industrial Attachment	0	3	3	MECH833
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 supervision of a practicum professor. Moreover, at the end of the course, individual student submits a final report and a performance evaluation made by the on-site supervisor.					
MECH844	Mechatronics Engineering Design Project B	0	6	3	MECH842
This course is a continuation of Mechatronics Engineering Design A (MECH862) 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 application 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.				
			TOTAL	6	