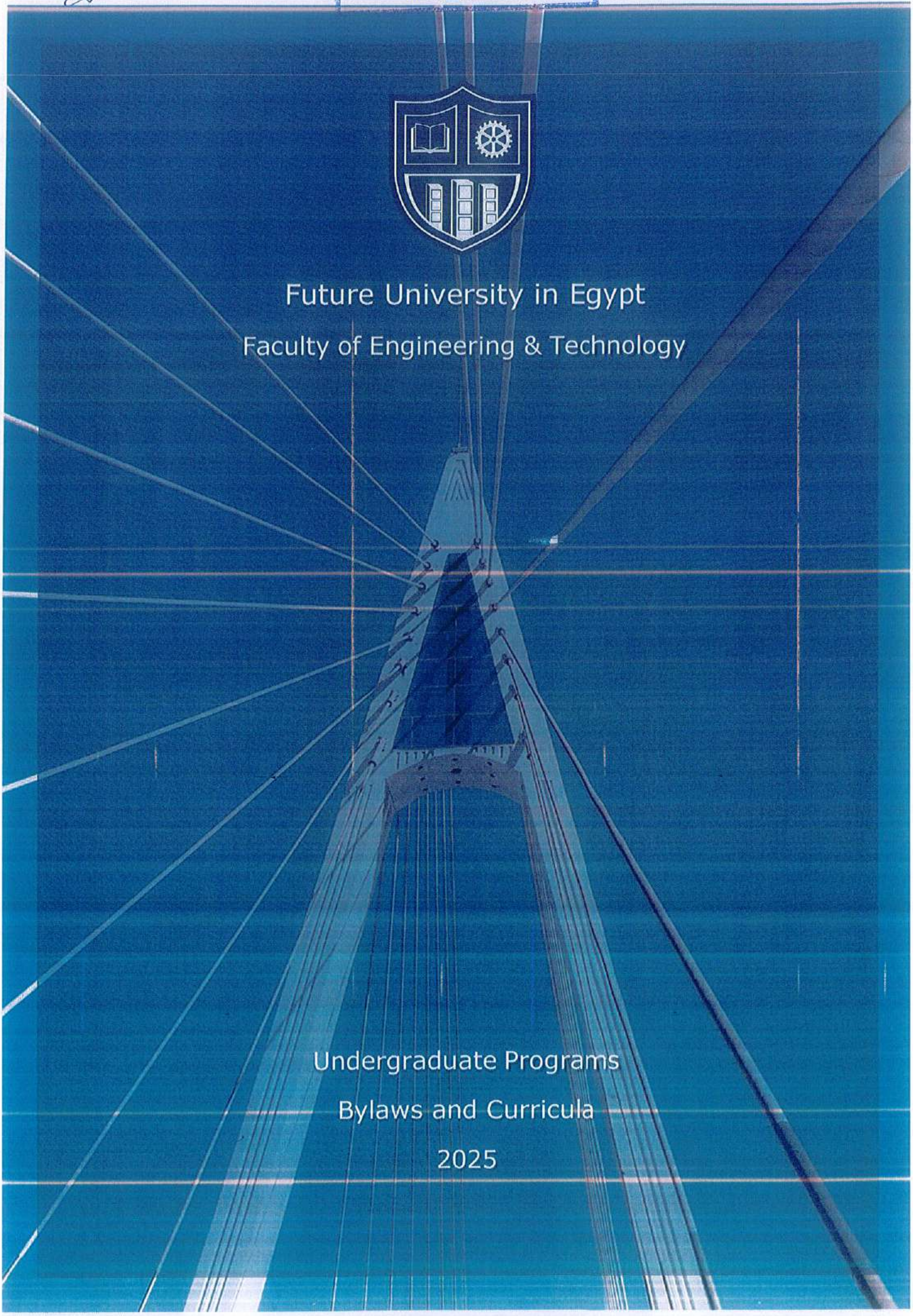
FUTURE UNIVERSITY IN EGYPT
FACULTY OF ENGINEERING AND TECHNOLOGY



Future University in Egypt

Faculty of Engineering & Technology

Undergraduate Programs

Bylaws and Curricula

2025

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1A. Faculty Profile

1A.1. Vision, Mission, Core Values, and Strategic Objectives

Vision

Achieving excellence in Engineering education, scientific and applied research, and community serving nationally and internationally.

Mission

The Faculty of Engineering and Technology at Future University in Egypt provides a promising academic and cultural environment that enables the graduation of outstanding engineers who are capable of competing nationally and regionally and well acquainted with the job market professionally and ethically. It also motivates conducting innovative scientific research and contributes to community serving and development.

Core Values

Distinction

Integrity and Transparency

Justice, Accountability, and Governance

Community Responsibility

Strategic Goals and Objectives

الغايات والأهداف الاستراتيجية

الغايات	الأهداف الاستراتيجية
الغاية رقم 1 تعليم هندسي متميز يواكب معايير الجودة المحلية والعالمية	1. التطوير المستمر للبرامج التعليمية وضمان تميز العملية التعليمية طبقا للمعايير العالمية. 2. تعزيز نظم دعم الأنشطة والخدمات الطلابية 3. تنمية قدرات الطلاب بما يدعم اكتساب الجدارات المهنية والقيم للمنافسة في سوق العمل. 4. تعظيم الاستفادة من برامج التعاون الدولي في إعداد برامج الكلية المطورة للاعتماد الدولي
الغاية رقم 2 التميز في البحث العلمي والابتكار بما يحقق استراتيجية التنمية المستدامة ورؤية مصر 2030	5. تطوير مستمر لبرامج الدراسات العليا بما يحقق المعايير الأكاديمية المحلية والعالمية 6. ربط البحث العلمي بالكلية باحتياجات المجتمع المحلي والدولي 7. تطوير البيئة الداعمة للبحث العلمي بالكلية للارتقاء بالإنتاج البحثي كماً وكيفاً 8. دعم قيم أخلاقيات البحث العلمي وحماية حقوق الملكية الفكرية بالكلية
الغاية رقم 3 تعزيز المشاركة المجتمعية بما يساهم في تحقيق أهداف التنمية المستدامة ورؤية مصر 2030	9. تميز الخدمات المجتمعية النوعية بما يسهم في تحقيق التنمية المستدامة تمشياً مع رؤية مصر 2030 10. توسيع نطاق التفاعل والشراكة بين الكلية والمجتمع المحلي والدولي 11. تعظيم الاستفادة من الموارد المادية والمالية للكلية والحفاظ على بيئة آمنة
الغاية رقم 4 تطوير الأداء المؤسسي للكلية	12. توفير نظام ادارة يرتكز على الحوكمة المؤسسية 13. تعزيز قدرات أعضاء هيئة التدريس والهيئة المعاونة والجهاز الإداري لضمان كفاءة العملية التعليمية والإدارية 14. الارتقاء بالأداء المؤسسي للكلية

1A.2. Scientific Departments

The Faculty of Engineering and Technology, Future University in Egypt comprises the following scientific Departments:

1. Architectural Engineering Department.
2. Biomedical Engineering Department.
3. Electrical Engineering Department.
4. Engineering Mathematics and Physics Department.
5. Mechanical Engineering Department.
6. Petroleum Engineering Department.
7. Structural Engineering and Construction Management Department.

1A.3. Academic Reference Standards

The Program Aims and Program Graduate Competencies of the educational programs of the Faculty are developed in accordance with the National Academic Reference Standards (NARS 2018) for Bachelor degree of engineering issued by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE - 2018).

1A.4. FUE-FET Graduate Attributes

The Engineering Graduate must:

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.
8. Use techniques, skills and modern engineering tools necessary for engineering practice
9. Demonstrate leadership qualities, business administration and entrepreneurial skills>
10. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

1A.5. NAQAAE Accreditation

The Faculty of Engineering and Technology has earned the institutional accreditation of NAQAAE (the National Authority for Quality Assurance and Accreditation of Education) on December 7, 2020 for 5 years. This accreditation comprises the six study programs offered by the Faculty:

- ✓ Architectural Engineering
- ✓ Electronics and Communication Engineering
- ✓ Electrical Power Engineering
- ✓ Mechatronics Engineering
- ✓ Structural and Construction Management Engineering
- ✓ Petroleum Engineering

1A.6. ACAET Accreditation

The Faculty of Engineering and Technology has earned the accreditation of the Arab Commission for Accreditation in Engineering and Technology (ACAET) from October 1st to September 30th 2025. This accreditation comprises the six study programs offered by the Faculty:

- ✓ Architectural Engineering
- ✓ Electronics and Communication Engineering
- ✓ Electrical Power Engineering
- ✓ Mechatronics Engineering
- ✓ Structural and Construction Management Engineering
- ✓ Petroleum Engineering


This is To Certify That The Following Program(s) at :

Future University in Egypt

Is Accredited by
The Arab Commission For Accreditation in Engineering And Technology(ACAET)
From October 1st 2021 to September 30th 2025.

- Architectural Engineering BSc Program
- Petroleum Engineering BSc Program
- Electrical Engineering BSc Program
- Mechatronics Engineering BSc Program
- Electronic Engineering and Communication Technology BSc Program
- Structural Engineering and Construction Management BSc Program

PROF. ADIL AL-HADITHI
ACAET PRESIDENT

PROF. QUSAY F. AL SALHY
COMMISSON CHAIR

1A.7. FUE in QS Ranking of 2025

Future University in Egypt (FUE) has been recognized among the Top 50 universities in the QS Arab Region University Rankings 2025. FUE has attained the following prestigious rankings 2025:

- Top-ranked private university in the Arab Republic of Egypt
- Among the top 5 universities in Egypt
- Among the top 50 universities in the Arab world
- Among the top 20 universities in the African continent
- Among the top 950 universities in the world

1A.8. Academic Partnerships

University of Cincinnati, USA

FUE and the University of Cincinnati (UC) signed an agreement for an academic partnership in July 2013. The Agreement includes the undergraduate programs in the Faculty of Engineering & Technology. In collaboration with FUE professors, an academic team from UC reviewed the curricula and identified areas for improvement. The collaboration includes a number of joint FUE/UC initiatives including, but not limited to, student and professor exchange, research projects, seminars, and annual audits.

Missouri University of Science and Technology, USA

The aim of the agreement is to promote the academic, scientific, technical and cultural relations between FUE and Missouri University for Science and Technology through academic exchange, scientific research, professional internships, technical cooperation, etc... The agreement is also aimed at collaboration between the two universities in establishing the Petroleum Engineering Department as an added value to the Faculty of Engineering and Technology at FUE. This agreement was signed on May 18, 2011.

1A.9. Industry Advisory Boards

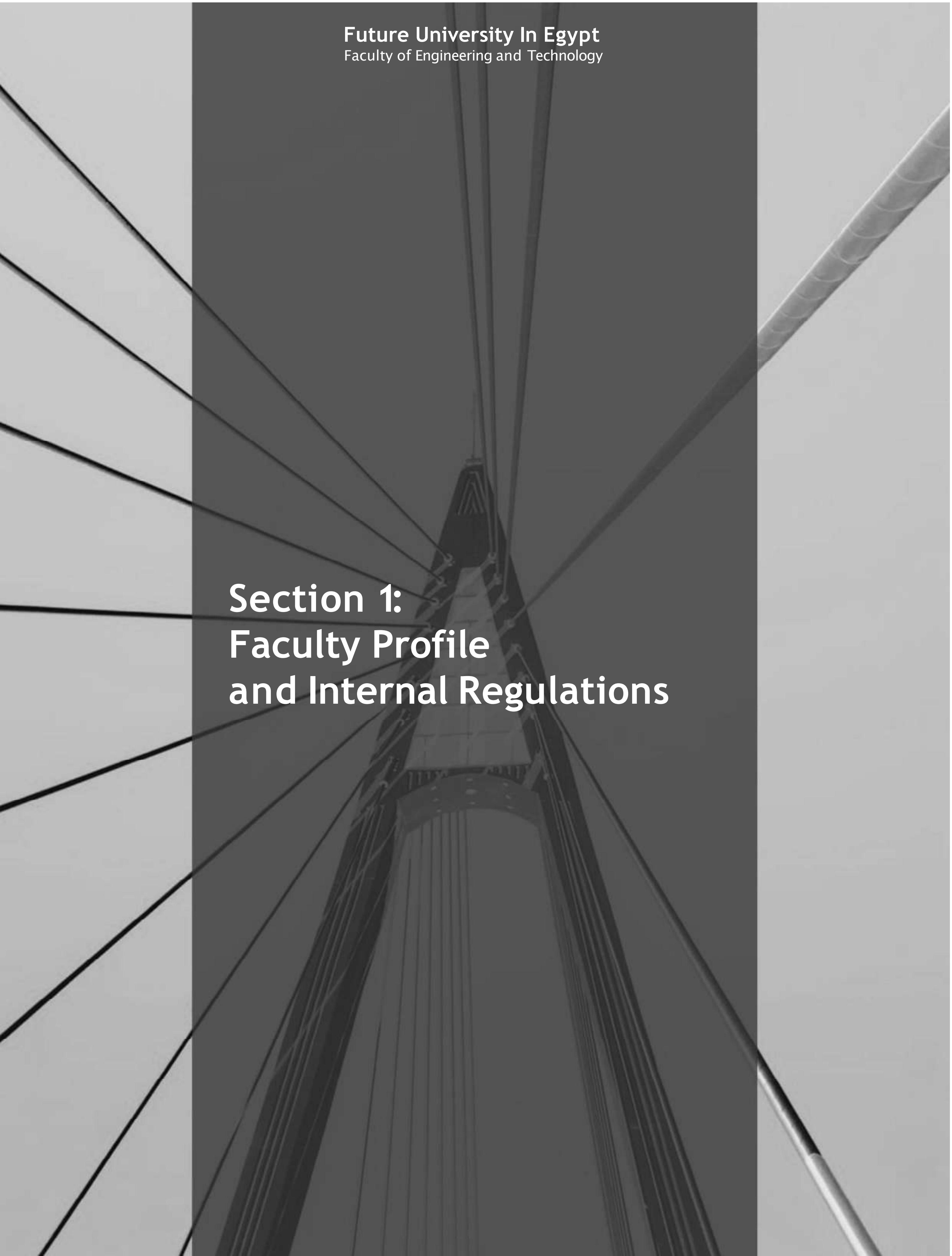
The Faculty of Engineering and Technology has established an Industry Advisory Board (IAB) for each of its offered academic programs. The main objective of these IABs is to provide for each academic program a freethinking review mechanism supported by selected experts from various industry sectors.

The tasks of IAB are:

1- Reviewing of Graduate Competencies of the academic program to ensure its adequacy for contemporary requirements of job market, and develop ideas of upgrading plans for the program and courses.
2- Evaluating the students' performance in graduation projects from the industry point of view and propose strategies for improvements.
3- Establishing collaboration channels between the scientific Department and different industrial bodies with respect to R&D, engineering consultations and continuing education.
4- Providing field training opportunities for students to enrich their hands-on skills.
5- Assisting in enhancing the opportunities of hiring the program graduates

1A.10. Bylaw Framework

The general regulations of this Bylaw, as well as the structures of all programs, comply with the conditions and constraints contained in the two reference frames issued by the Engineering Studies Sector Committee and approved by the Supreme Council of Universities: Framework for the Preparation of Undergraduate Programs in Engineering Faculties (2022), Terms of reference for the credit-hour study system in the faculties of engineering (2022).



Section 1:
Faculty Profile
and Internal Regulations

1B. Internal Regulations of Undergraduate Programs

Article (1): Scientific Departments and Offered Programs

- The Faculty of Engineering and Technology at Future University in Egypt comprises the following scientific Departments:
  1. Architectural Engineering Department.
  2. Electrical Engineering Department.
  3. Mechanical Engineering Department.
  4. Structural Engineering and Construction Management Department.
  5. Petroleum Engineering Department.
  6. Biomedical Engineering Department.
  7. Engineering Mathematics and Physics Department.

- The Faculty of Engineering and Technology offers ten major programs. A major program is a field of study in which a student selects to earn a Bachelor of Science (B.Sc.) degree. Future University in Egypt (FUE) awards B.Sc. degrees for the following major programs, upon the request of the Faculty Council:

#	B.Sc. in Engineering Degrees Offered by FUE (Major Programs 144 Credit Hours)
1	B.Sc. in Architectural Engineering
2	B.Sc. in Architectural Engineering - Interior Architecture Engineering
3	B.Sc. in Electrical Engineering - Electrical Power Engineering
4	B.Sc. in Electrical Engineering - Electronics and Communication Engineering
5	B.Sc. in Electrical Engineering - Computer and Intelligent Systems Engineering
6	B.Sc. in Electrical Engineering - Biomedical Engineering
7	B.Sc. in Mechanical Engineering - Mechatronics Engineering
8	B.Sc. in Mechanical Engineering - Sustainable Energy Engineering
9	B.Sc. in Civil Engineering - Structural Engineering and Construction Management
10	B.Sc. in Petroleum Engineering

- The Faculty of Engineering and Technology also offers nine optional minor programs. Each minor program consists of an additional coursework of 18 credit hours in a specific area that complements the primary field of study. Below is the list of the minor programs available.

#	Minor Program (18 Credit Hours)	Department Offering the Program
1	Environmental Landscape Architecture (Minor)	Architectural Engineering Dept.
2	GIS for Smart Cities (Minor)	
3	Interior Architecture Engineering (Minor)	
4	Intelligent Systems Engineering (Minor)	Electrical Engineering Dept.
5	Robotic Automation Engineering (Minor)	Mechanical Engineering Dept.
6	Sustainable Energy Engineering (Minor)	
7	Engineering Project Management (Minor)	Structural Engineering and Construction Management Dept.
8	Petroleum Engineering (Minor)	Petroleum Engineering Dept.
9	Biomedical Engineering (Minor)	Biomedical Engineering Dept.

Article (2): Admission and Transfer Requirements

- Students are eligible for enrollment in the Faculty if they hold the Egyptian General Secondary Education Certificate – Math section (Thanaweya Amma - Riyadhiat) or an equivalent qualification, or if they are transferring from another university. This is in accordance with the rules and conditions set annually by the Council of Private and National Universities (CPNU).
- The student is eligible to specialize in a major program after completing a minimum of 18 credit hours with a minimum GPA of 1.5.
- Each new academic year, the Faculty Council establishes general rules for admitting students to various study programs. These rules consider:
  - The student preferences,
  - The principle of equal opportunities,
  - The specialization requirements set by the department offering the program, and
  - The available capacity of each program.
- A student may transfer from the major program he/she has enrolled in to another program, provided that the admission requirements for the new program are met and the Dean approves the transfer request.

Article (3): Study System

- The system of study of all the academic programs offered by the faculty is the credit hour system, in which one Credit Hour (CH) is awarded for:
    - One contact hour of a weekly lecture over a 15-week semester, or
    - Two to three contact hours of weekly tutorials, labs, workshops, or studio sessions over a 15-week semester.
- One contact hour consists of a 50-minute instruction session followed by a 10-minute break.
- English is the official language of instruction and must be used for lectures, discussions, assignments, reports, and exams.
- The Faculty Council, after consulting the relevant department council and based on the nature of the courses, may decide to teach one or more courses using the blended learning model. This means that 60-70% of the course will be face-to-face and 30-40% will be distance learning. This decision will be presented to the University Education and Student Affairs Council for approval and then submitted to the University Council for ratification.

Article (4): Student Study Level

The student's study level is determined by the percentage of credit hours completed successfully out of the total hours required for the program:

Study Level	CHs Completed Successfully in Percent of Total CHs of the Program	Study Level Title
1	Less than 25%	Freshman
2	From 25% to less than 50%	Sophomore
3	From 50% to less than 75%	Junior
4	From 75% to less than 100%	Senior

Article (5): Academic Semesters and Course Registration

The academic year is composed of three study semesters:

- The first main semester (Fall Semester) usually starts late September and lasts for 15 weeks, followed by final exams for 3 weeks.

- The second main semester (Spring Semester) usually starts early February and lasts for 15 weeks, followed by final exams for 3 weeks.
- The Summer semester, which is an optional semester, starts late June or early July and lasts for 7 weeks, followed by 1-week final exams.
- Courses are registered during the week preceding the start of the semester.

Article (6): Program Study Duration

- The scientific degree shall be awarded to the student after fulfilling the graduation requirements mentioned in Article (22) of this Bylaw.
- The program study duration must not be less than **eight** main semesters (**four** academic years).
- The maximum allowed study duration is **sixteen** main semesters (**eight** academic years), excluding semesters suspended for reasons accepted by the Faculty Council. After this period, the student is dismissed from the program.

Article (7): Academic Advising

Each student will be assigned an academic advisor, from the faculty members, to offer counsel and advice. The advisor provides guidance to students for the selection of academic track and for course registration of each semester. He might suggest repeating previously passed courses to improve student's Cumulative Grade Point Average (CGPA) for the graduation requirement. Furthermore, the academic advisor assists the student in choosing a suitable practical training placement and graduation project topic.

Article (8): Rules for Course Registration

- The student's academic load (the number of registered CH in the semester) is determined by the academic advisor, ensuring it does not exceed the maximum limit specified in the following table:

Academic Load in CH against CGPA			
	Cumulative Grade Point Average (CGPA)		
Semester	CGPA < 2.0	2.0 ≤ CGPA < 3.0	CGPA ≥ 3.0
Fall / Spring	Up to 14 CH	Up to 18 CH	Up to 21 CH
Summer	Up to 8 CH	Up to 8 CH	Up to 9 CH

- A student may register for one additional course beyond the above limits if this leads to his/her graduation, after the approval of the academic advisor.
- If there are no courses available for the student to register in to complete the allowed number of hours, the student is permitted to register for a course for which he/she did not pass the prerequisite course, provided he/she attended its final exam. This is subject to the recommendation of the academic advisor and the approval of the Faculty Council, provided that the course is to be registered simultaneously with the prerequisite required to be repeated.

Article (9): Add, Drop, and Withdraw of Courses

A student may add and drop courses within the first two weeks of a main semester, or within the first week of a summer semester, without suffering any penalty. After this period, and no later than the 12th week of a main semester or the 4th week of a summer semester, a student may withdraw from a registered course. In this case, the course fees will not be refunded; however, the student will receive a Withdrawn grade (W), and the CGPA will not be affected due to this course withdrawal.

Article (10): Incomplete Courses

If a student does not attend the final exam of the course with an excuse accepted by the Faculty Council, he/she receives a final grade of "Incomplete (I)" for the course. The grade "I" is not factored into the calculation of the Cumulative Grade Point Average (CGPA). In this situation, the final exam will be rescheduled for the student until the beginning of the next main semester, while the student's semester work marks are retained. If the student fails to attend the rescheduled final exam on the designated date without an excuse accepted by the Faculty Council, he/she will receive a Fail (F) grade in the course.

Article (11): Course Repeating

The student can repeat a course (studying and examining) according to the following two cases:

A. <u>Retaking a Failed Course</u>

The following conditions apply to a student who has failed a course (Grade F):

1. If a student fails a compulsory course, he/she must retake the course in a subsequent semester.
2. If a student fails an elective course, he/she may retake the same course or choose another elective course as per the rules for selecting elective courses stated in the bylaw of the relevant study program.

3. When the student passes the course, he/she will receive the course grade after the retake, with a maximum B+, which will be used in the calculation of the semester GPA and the cumulative average CGPA, provided that the cases of failure are recorded in the student's transcript.

B. Retaking a Passed Course

A student may repeat a previously passed course to improve his/her CGPA according to the following conditions:

1. Repeating courses for improvement shall not exceed five times during the period of his study, except for cases of improvement to achieve the graduation requirements.
2. The student gets the highest grade among all attempts. This grade is used in CGPA calculation, and all attempts shall appear in the student's transcript.
3. If the student fails in the repetition, his/her previous grade for the course is canceled and he/she will receive a Fail (F) grade in the course.

- If a student repeats a course, he/she is required to complete all assessment requirements of the course until they are fully reassessed.

Article (12): Attendance Policy

- The student is required to attend all activities of the course for which he/she registers. A student who is absent for more than 15% of the total contact hours of the course without an acceptable excuse will receive an academic warning. A student who is absent for more than 25% of the course hours without a valid excuse accepted by the Faculty Council will be prohibited from participating in all subsequent activities and/or examinations scheduled for that course and will receive a Fail (F) grade.
- The student may apply for withdrawal from a course if his/her absence rate exceeds 25%. According to Article (8) of this Bylaw, in such a case, the student will not fail the course and will receive a withdrawal grade (W).

Article (13): Course Assessment Policy

- The marks for a given course (100 Marks) are allocated on the semester's work and the final exam, depending on the course's nature. The assessment policy must be communicated to students through the course specification at the beginning of the semester. Most undergraduate courses should adhere to the regular assessment scheme for marks distribution outlined below:

1. Final Exam

The final exam should be comprehensive and cover all course topics; it constitutes 40 Marks.

2. Midterm Exam

The midterm exam constitutes 20 to 30 Marks. It should be conducted within the 8^{th} and 9^{th} weeks. Its model answer should be discussed in class.

3. Other assessment components

Other assessment components, which constitute 30 to 40 Marks, may include: Quizzes, Assignments, Practical exams (if applicable), Oral exams (if applicable), Course reports/ projects (if applicable), and student Performance and Participation, provided that the grades for any academic activity do not exceed 30 marks.

The distribution of marks of a course can be modified after the approval of the Faculty Council based on a proposal by the Scientific Department offering that course.

Article (14): Course Grading

- There are two conditions to pass a regular course:
  1- The student must attend the final exam and achieve at least 40% of its total grade.
  2- The overall marks obtained by the student in the course must be at least 60 out of 100 Marks.
- For non-credit courses (0 CH), the earned grade is either Pass or Fail (P/F). A Pass grade indicates that the student achieved at least 60% of the course marks. The grade of non-credit courses will not be included in the CGPA calculation.
- The following grading system is adopted for this bylaw:

Grade	Percentage Marks	Grade Points	Grade	Percentage Marks	Grade Points
A+	97% and higher	**4.0**	**C+**	73% to less than 76%	**2.3**
A	93% to less than 97%	**4.0**	**C**	70% to less than 73%	**2.0**
A-	89% to less than 93%	**3.7**	**C-**	67% to less than 70%	**1.7**
B+	84% to less than 89%	**3.3**	**D+**	64% to less than 67%	**1.3**
B	80% to less than 84%	**3.0**	**D**	60% to less than 64%	**1.0**
B-	76% to less than 80%	**2.7**	**F**	Less than 60%	**0.0**

- In addition, the non-credit grades are:

Grade	Meaning	Description
P/F	Pass/Fail	Grades for non-credit hour courses
W	Withdrawn	According to the conditions of Article (9)
I	Incomplete	According to the conditions of Article (10)

Article (15): Makeup Examination

A student who fails in a course (obtained an F grade) may be allowed to repeat the final exam of the course in the same semester within two weeks of the end of the final exams according to the following rules:

- The student's grade in the course should not be less than 55% of the total course grades, provided that the student's score in the final exam is not less than 50% of the total grade of the exam.
- The student's grade in the course after repetition should not exceed 1.7 (C-).
- If the student does not obtain a grade that enables him to pass the course, he must repeat the course in study and examination in accordance with Article (11) of these regulations.
- The student is granted this permission for only one course in the same semester.
- The student's transcript will record the result of the course after the makeup exam.

Article (16): Student Appeals

A student can submit an appeal to review his/her course marks within two weeks of the announcement of results after paying the required fees as per Faculty regulations. A committee formed by the relevant Scientific Department, which includes the course instructor, will review the appeals and take appropriate action accordingly.

Article (17): Calculation of Grade Point Average

- Course points are calculated by multiplying the grade points a student earned for a course by the course's credit hours.
- The Grade Point Average (GPA) is determined by dividing the total number of semester course points by the total number of semester hours attempted as follows:

$$GPA = \frac{\sum_{Semester\ Courses} Grade\ Points * Credit\ Hours}{\sum_{Semester\ Courses} Credit\ Hours}$$

- The Cumulative Grade Point Average (CGPA) is calculated by dividing the total number of course points accumulated by the total number of credit hours attempted, as follows:

$$GPA = \frac{\sum_{All\ Courses} Grade\ Points * Credit\ Hours}{\sum_{All\ Courses} Credit\ Hours}$$

Article (18): Registration Suspension

The Faculty Council may suspend a student's registration for a period not exceeding four main semesters (continuous or discontinuous) during the study duration, based on a justification accepted by the Council that prevents the student from continuing his/her studies regularly.

Article (19): Probation, and Dismissal

- If a student's CGPA falls below 2.0, he/she will be placed on probation.
- The student will be dismissed from the Faculty under the following circumstances:
  - If he/she obtains a CGPA of less than 1.0 in the first three main semesters.
  - If his/her CGPA remains below 2.0 for **six** consecutive main semesters.
  - If the student fails to meet the graduation requirements within the maximum allowed study duration.
- In dismissal situations, a student may appeal to the Dean for permission to continue the study, supported by documentation of his/her social and/or health conditions. The Faculty Council will study the appeal to determine the appropriate action. For a student who has completed 80% of the graduation requirements, the Faculty Council may grant him a final opportunity of **two** additional consecutive main semesters, along with a summer semester, to improve his/her CGPA before final dismissal.

Article (20): Graduation Project

- The graduation project consists of two courses, except for the two architectural engineering programs, that extend over the two main semesters of the final year of study, in addition to an additional period of three weeks after the final exams. Each course is evaluated independently as per the credit hour system. The student will be eligible to register for the first course upon completing no less than 100 credit hours.

- Graduation projects apply both engineering knowledge and skills acquired during the course work to the solution and design of real-world applications. The first part of the project should include a survey of the project subject area with reference to appropriate literature, besides the time schedule for the design and implementation phases of the project. The second part represents the design phase in which basic sciences, mathematics and engineering sciences are integrated to optimize the use of resources for the purpose of achieving a stated goal. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation. The student should take into consideration the appropriate engineering standards and codes, and multiple constraints during the different phases of the project.
- The supervisor evaluates the contribution of each student during the different phases of the project. A printed version of the project report beside the final product of the project work should be submitted to the Department prior to the date of discussion. The jury members from academia and industry evaluate the student work based on project report, final product, oral presentation, and discussion.

Article (21): Practical Training

Practical training is a part of the curriculum of all major programs of the Faculty. The overall duration of the training is 150 hours, divided over two non-credit courses (75 training hours each) and should be carried at one or more engineering facilities (inside or outside Egypt). The training program shall be related to the student's major program and must be approved by the scientific department. The student is eligible to register the first and second training course after completing a minimum of 54 CH and 90 CH respectively. After completing each module, the student will submit a report and deliver a presentation to be evaluated by the scientific department.

Article (22): Degree Awarding Requirements

- To be awarded a Bachelor of Science (B.Sc.) Degree in Engineering, students must:
    - Successfully complete 144 credit hours with a Cumulative Grade Point Average (CGPA) of 2.0 (C) or higher.
    - Successfully pass the graduation project.
    - Successfully pass the practical training
- The student can study several courses in another university which has a cooperation agreement with Future University in Egypt. This requires prior approval from the Faculty Council. The credit hours of these courses are included in the student's graduation requirements, provided that the total credit hours of the approved courses do not exceed 72 CH.

Article (23): Graduation Grades and Rank of Honor

The awarded grades of graduation are related to the CGPA as described in the following table.

Graduation Grade	Graduation CGPA
Distinction	CGPA $\geq$ 3.7
Very Good	3.0 $\leq$ CGPA < 3.7
Good	2.3 $\leq$ CGPA < 3.0
Pass	2.0 $\leq$ CGPA < 2.3

To merit the Rank of Honor, the student must fulfil the following conditions:

- Maintain a CGPA not less than 3.3 throughout his/her study at the major program,
- Have not failed any course throughout his/her study at the major program, and
- Have no disciplinary punishment imposed on him during the duration of the program.

Article (24): Minor Programs and Concentrations

- A minor program represents supplemental coursework in a selected area that complements the main area of study. Minor programs may give graduates additional competitive advantage for the labor market. However, enrollment in a minor program is not mandatory to earn a B.Sc. degree. After completing 100 CH, a student may register in a minor program or more in accordance with the enrollment requirements included in this bylaw. Each minor program comprises a group of compulsory and/or elective courses in total 18 CH.
- A major program may distribute its elective courses on several Concentrations (tracks) where each concentration represents a sub-specialization that falls under the general specialization of the program. Concentration will be mentioned in the student's transcript if he/she satisfies the required number of courses/CH specified by the relevant major program as per this Bylaw.

Article (25): Updating of Bylaws

The Faculty Council can perform some slight modifications to this Bylaw without referring to the Engineering Studies Sector Committee - Supreme Council of Egyptian Universities. These modifications include but are not limited to:

- Adding elective courses to major and minor programs,

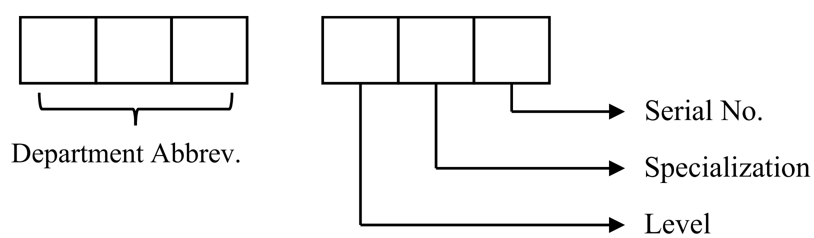
- Modification of course contents (not more than 50%),
- Modification of course prerequisites,
- Modification of marks distribution of a course,
- Modification of contact hours of a course without changing its credit hours,
- Modification of study level of a course.

Article (26): General Provisions

- Following the issuance of the ministerial decree approving this Bylaw, and provided that the necessary equivalency (clearance) process is made, this bylaw shall be applicable to new students to be admitted to the Faculty starting from main semester following ministerial decree issuance, as well as students already enrolled in the Faculty and earning 40 CH or less by the date of ministerial decree issuance.
- In addition, any student enrolled in the faculty at the time the ministerial decision was issued who has completed no more than 72 credit hours, may submit a request to the dean to be transferred to this bylaw, and the request shall be submitted to the Educational and Student Affairs Committee for an opinion and to the Faculty Council for approval. After that, the required equivalency will be conducted.
- The rules for scientific equivalency shall be applied on the basis of the scientific content of the courses when transferring from a previous bylaw to this bylaw.

Article (27): Course Coding System

The course code starts with the abbreviation of the Department as per the table below, followed by 3 digits: the study level, the area of specialization number, and the course serial number.



Faculty Course Coding

#	Department	Abbreviation
1	Architectural Engineering Department	ARC
2	Biomedical Engineering Department	BME

3	Electrical Engineering Department	EED
4	Engineering Mathematics & Physics Department	EMP
5	Mechanical Engineering Department	MEC
6	Petroleum Engineering Department	PET
7	Structural Engineering & Construction Management Dept.	SCM
8	Faculty courses that not offered by any of the scientific departments and are managed by the college's vice dean for education and students.	GEN
9	University courses offered by departments from other faculties and are managed by the college's vice dean for education and students.	ENG, UNV

1C.

اللائحة الداخلية لبرامج البكالوريوس

المادة (1): الأقسام العلمية بالكلية والبرامج المطروحة

- تضم كلية الهندسة والتكنولوجيا بجامعة المستقبل سبعة أقسام علمية:
  1- قسم الهندسة المعمارية
  2- قسم الهندسة الكهربائية
  3- قسم الهندسة الميكانيكية
  4- قسم الهندسة الإنشائية وإدارة التشييد
  5- قسم هندسة البترول
  6- قسم الهندسة الحيوية الطبية
  7- قسم الرياضيات والفيزياء الهندسية

- تقدم كلية الهندسة والتكنولوجيا عشرة برامج رئيسية (Majors)، حيثُ يمثل البرنامج الرئيسي مجال الدراسة الذي يختاره الطالب للحصول على درجة البكالوريوس، وتمنح جامعة المستقبل، بناء على طلب مجلس كلية الهندسة والتكنولوجيا، درجة بكالوريوس العلوم في الهندسة في البرامج الدراسية التالية:

#	درجات البكالوريوس في العلوم التي تطرحها كلية الهندسة والتكنولوجيا – جامعة المستقبل (البرامج الرئيسية 144 ساعة معتمدة)
1	بكالوريوس العلوم في الهندسة المعمارية
2	بكالوريوس العلوم في الهندسة المعمارية – هندسة العمارة الداخلية
3	بكالوريوس العلوم في الهندسة الكهربائية – هندسة القوى الكهربائية
4	بكالوريوس العلوم في الهندسة الكهربائية – هندسة الإلكترونيات والاتصالات
5	بكالوريوس العلوم في الهندسة الكهربائية – هندسة الحاسب والنظم الذكية
6	بكالوريوس العلوم في الهندسة الكهربائية – الهندسة الحيوية الطبية
7	بكالوريوس العلوم في الهندسة الميكانيكية – هندسة الميكاترونيات
8	بكالوريوس العلوم في الهندسة الميكانيكية – هندسة الطاقة المستدامة
9	بكالوريوس العلوم في الهندسة المدنية – الهندسة الإنشائية وإدارة التشييد
10	بكالوريوس العلوم في هندسة البترول

- بالإضافة إلى ما سبق، تقدم كلية الهندسة والتكنولوجيا تسعة برامج ثانوية (Minors)، وهي برامج اختيارية، ويتألف كل برنامج من 18 ساعة معتمدة إضافية في مجال معين يُكمل المجال الرئيسي للدراسة. وفيما يلي قائمة بالبرامج الثانوية المطروحة:

#	البرامج الثانوية (18 ساعة معتمدة)	القسم العلمي الذي يطرح البرنامج
1	العمارة البيئية وتنسيق المو اقع (برنامج ثانوي)	قسم الهندسة المعمارية
2	نظم المعلومات الجغر افية للمدن الذكية (برنامج ثانوي)	
3	هندسة التصميم الداخلي (برنامج ثانوي)	
4	هندسة النظم الذكية (برنامج ثانوي)	قسم الهندسة الكهربائية
5	هندسة الأتمتة الروبوتية (برنامج ثانوي)	قسم الهندسة الميكانيكية
6	هندسة الطاقة المستدامة (برنامج ثانوي)	
7	إدارة المشاريع الهندسية (برنامج ثانوي)	قسم الهندسة الإنشائية وإدارة التشييد
8	هندسة البترول (برنامج ثانوي)	قسم هندسة البترول
9	الهندسة الحيوية الطبية (برنامج ثانوي)	قسم الهندسة الحيوية الطبية

المادة (2): متطلبات القبول والتحويل

- الطلاب المؤهلون للالتحاق بالكلية هم حملة شهادة الثانوية العامة المصرية (شعبة الرياضيات) أو ما يعادلها، أو المحولون من جامعات أخرى، وذلك وفقا للقواعد والشروط التي يصدرها سنويا مجلس الجامعات الخاصة والأهلية.
- يكون الطالب مؤهلاً للتخصص في أحد البرامج الرئيسية بعد إنجازه ما لا يقل عن 18 ساعة معتمدة بمعدل تراكمي لا يقل عن 1.5.
- يضع مجلس الكلية كل عام دراسي قواعد قبول الطلاب في البرامج الدراسية المختلفة وذلك بمراعاة:
    - اختيارات الطالب،
    - مبدأ تكافؤ الفرص،
    - متطلبات التخصص التي يحددها القسم الذي يطرح البرنامج،
    - السعة المتاحة للبرنامج.
- يجوز للطالب التحويل من البرنامج الرئيسي الذي التحق به إلى برنامج آخر بشرط تحقيق شروط الالتحاق في البرنامج الجديد وبعد مو افقة عميد الكلية على طلب التحويل.

المادة (3): نظام الدراسة

- نظام الدراسة لجميع البرامج الدراسية التي تقدمها الكلية هو نظام الساعات المعتمدة، حيث تمنح ساعة معتمدة واحدة (1 CH) مقابل:
    - ساعة اتصال واحدة من محاضرة أسبوعية على مدار فصل دراسي مدته 15 أسبوعا، أو
    - ساعتين إلى ثلاث ساعات اتصال أسبوعيا من حصص التمارين / المعمل / ورشة عمل / استوديو على مدار فصل دراسي مدته 15 أسبوعا.
- تنقسم ساعة الاتصال الواحدة إلى جلسة تعليمية مدتها 50 دقيقة بالإضافة إلى استراحة لمدة 10 دقائق.
- اللغة الإنجليزية هي اللغة الرسمية للتدريس، وينبغي استخدامها في إلقاء المحاضرات، والمناقشات، والتكليفات، والتقارير الدراسية، والامتحانات.
- يجوز لمجلس الكلية بعد أخذ رأي مجلس القسم المختص، وبناء على طبيعة المقررات، أن يقرر تدريس مقرر أو أكثر باستخدام بنمط التعلم الهجين. هذا يعني أن 60-70٪ من تدريس المقرر سيكون وجها لوجه و30-40٪ سيكون بنمط التعلم عن بعد. على ان يتم عرض هذا القرار على مجلس شئون التعليم والطلاب بالجامعة للمو افقة عليه ومن ثم عرضه على مجلس الجامعة لاعتماده.

المادة (4): المستوى الدراسي للطالب

يرتبط المستوى الدراسي للطالب بنسبة عدد الساعات المعتمدة التي أتمها بنجاح إلى إجمالي الساعات المعتمدة للبرنامج على النحو التالي:

#	المستوى الدراسي	نسبة الساعات المعتمدة التي أتمها الطالب بنجاح إلى إجمالي ساعات البرنامج
1	المستوى الأول (Freshman)	أقل من 25%
2	المستوى الثاني (Sophomore)	من 25% إلى أقل من 50%
3	المستوى الثالث (Junior)	من 50% إلى أقل من 75%
4	المستوى الرابع (Senior)	من 75% إلى أقل من 100%

المادة (5): الفصول الدراسية والتسجيل في المقررات

يتكون العام الدراسي من ثلاثة فصول دراسية:

- يبدأ الفصل الدراسي الرئيسي الأول (فصل الخريف) عادةً في أواخر شهر سبتمبر ويستمر لمدة 15 أسبوعاً، تليه الامتحانات النهائية لمدة 3 أسابيع.

- يبدأ الفصل الدراسي الرئيسي الثاني (فصل الربيع) عادةً في أوائل شهر فبراير ويستمر لمدة 15 أسبوعاً، تليه الامتحانات النهائية لمدة 3 أسابيع.
- يبدأ الفصل الصيفي، وهو فصل دراسي اختياري، في أواخر يونيو أو أوائل يوليو ويستمر لمدة 7 أسابيع، تليه الامتحانات النهائية لمدة أسبوع.
- يتم تسجيل المقررات خلال الأسبوع السابق لبدء الفصل الدراسي.

المادة (6): مدة الدراسة بالبرنامج

- تمنح الدرجة العلمية للطالب بعد استيفاء متطلبات التخرج المذكورة في المادة رقم (22) من هذه اللائحة.
- يجب ألا تقل مدة الدراسة في البرنامج عن ثمانية فصول دراسية رئيسية (أربع سنوات دراسية).
- الحد الأقصى المسموح به لمدة الدراسة هو ستة عشر فصلاً دراسياً رئيسياً (ثمان سنوات دراسية)، ولا يشمل ذلك الفصول الدراسية المجمدة لأسباب يقبلها مجلس الكلية، وبعد هذه المدة يتم فصل الطالب من البرنامج.

المادة (7): الإرشاد الأكاديمي

يُعين لكل طالب مرشداً أكاديمياً من أعضاء هيئة التدريس يقوم بتقديم التوجيه والمشورة للطالب، ويساعده في اختيار مساره الأكاديمي وكذلك في اختيار المقررات لكل فصل دراسي، ويجوز للمرشد الأكاديمي أن يطلب من الطالب إعادة بعض المقررات التي اجتازها بالفعل لرفع معدله التراكمي (CGPA) إلى المعدل المطلوب للتخرج. كما يقوم المرشد الأكاديمي بمساعدة الطالب في اختيار مكان التدريب العملي وموضوع مشروع التخرج.

المادة (8): شروط تسجيل المقررات الدراسية

- يتم تحديد العبء الدراسي للطالب (عدد ساعات التسجيل في الفصل الدراسي) بواسطة المرشد الأكاديمي، مع عدم تجاوز الحد الأقصى المحدد بالجدول التالي:

العبء الدراسي للطالب مقابل معدله التراكمي			
الفصل الدراسي	المعدل التراكمي		
	CGPA ≥ 3.0	2.0 ≤ CGPA < 3.0	CGPA < 2.0
الخريف / الربيع	حتى 21 ساعة معتمدة	حتى 18ساعة معتمدة	حتى 14 ساعة معتمدة
الصيف	حتى 9 ساعات معتمدة	حتى 8 ساعات معتمدة	حتى 8 ساعات معتمدة

- يُمكن للطالب تسجيل مقرر دراسي إضافي واحد زيادة عن الحدود المذكورة أعلاه إذا كان ذلك سيؤدي إلى تخرجه، وذلك بعد موافقة المرشد الأكاديمي.
- في حالة عدم توفر مقررات يمكن للطالب تسجيلها لاستكمال عدد ساعات التسجيل المسموح بها، يُسمح له بالتسجيل في مقرر لم ينجح في متطلبه السابق، بشرط حضوره امتحانه النهائي، وذلك بتوصية من المرشد الأكاديمي وموافقة مجلس الكلية، على أن يُسجل المقرر بالتزامن مع المتطلب السابق المطلوب إعادته.

المادة (9): إضافة وحذف المقررات والانسحاب منها

يجوز للطالب إضافة وحذف المقررات خلال الأسبوعين الأولين من الفصل الدراسي الرئيسي، أو الأسبوع الأول من الفصل الصيفي، دون تحمل أي عقوبة، وبعد مرور هذا الوقت وفي موعد لا يتجاوز الأسبوع 12 من الفصل الدراسي الرئيسي، أو الأسبوع 4 من الفصل الصيفي، يجوز للطالب الانسحاب من المقرر، وفي هذه الحالة لن يتم رد رسوم التسجيل له، ويتم منح الطالب تقدير الانسحاب (W)، ولا يتأثر معدله التراكمي بهذا الانسحاب.

مادة (10): المقررات الدراسية غير المكتملة

إذا لم يحضر الطالب الامتحان النهائي للمقرر بسبب عذر يقبله مجلس الكلية، يحصل الطالب على تقدير "غير مكتمل (I)" في هذا المقرر، ولا يتم تضمين هذا التقدير في حساب المعدل التراكمي (CGPA)، وفي هذه الحالة يتم تأجيل الامتحان النهائي للطالب حتى بداية الفصل الدراسي الرئيسي التالي مع الاحتفاظ بدرجات الأعمال الفصلية للطالب، وإذا لم يحضر الطالب الامتحان النهائي المؤجل في الموعد المعلن دون عذر يقبله مجلس الكلية يحصل على تقدير راسب (F) في المقرر.

مادة (11): إعادة المقررات الدراسية

- يُمكن للطالب إعادة مقرر دراسي دراسةً وامتحاناً وفق الحالتين التاليتين:

أ- <u>إعادة مقرر سبق الرسوب فيه</u>

يخضع الطالب الذي يعيد دراسة مقرر سبق له الرسوب فيه (تقديره F) للشروط التالية:

1. إذا رسب الطالب في مقرر إجباري فيجب عليه إعادة هذا المقرر في فصل دراسي لاحق.
2. إذا رسب الطالب في مقرر اختياري، فيجوز له إعادة دراسة نفس المقرر أو دراسة مقرر اختياري آخر يستوفي شروط اختيار المقررات الاختيارية المذكورة في لائحة البرنامج الدراسي المعني.
3. عند نجاح الطالب في المقرر يحصل على تقدير المقرر بعد الإعادة وبحد أقصى +B، ويدخل هذا التقدير في حساب المعدل الفصلي GPA والمعدل التراكمي CGPA مع ظهور حالات الرسوب في السجل الأكاديمي للطالب.

ب- <u>إعادة مقرر سبق النجاح فيه</u>

يجوز للطالب إعادة مقررٍ دراسيٍ سبق له النجاح فيه بهدف تحسين معدله التراكمي وفقاً للشروط التالية:

1. ألا تزيد مرات التحسين عن خمس مرات خلال مدة دراسته ويستثنى من ذلك حالات التحسين لتحقيق متطلبات التخرج.
2. يحصل الطالب على أعلى تقدير بين جميع مرات نجاحه في المقرر، ويتم استخدام هذا التقدير في حساب المعدل التراكمي، وتظهر جميع المحاولات في السجل الأكاديمي.
3. في حالة رسوب الطالب في الإعادة يلغى تقديره السابق في المقرر ويعتبر راسباً فيه ويحصل على تقدير F.

- إذا قام الطالب بإعادة مقرر دراسي، فإنه يطلب منه إعادة جميع متطلبات تقييم المقرر حتى يُعاد تقييمه بالكامل.

المادة (12): سياسة الحضور والغياب

- يجب على الطالب حضور جميع أنشطة المقرر الذي سجل فيه. وإذا تغيب عن أكثر من 15٪ من إجمالي ساعات الاتصال للمقرر دون عذر مقبول يُعطى إنذاراً أكاديمياً، ويُحرم الطالب الذي يتغيب عن أكثر من 25٪ من ساعات المقرر، دون عذر مقبول يقبله مجلس الكلية، من أداء ما تبقى من أنشطة و/أو امتحانات خاصة بالمقرر ويُعطى تقدير راسب (F).
- يُمكن للطالب التقدم بطلب الانسحاب من مقرر إذا تجاوزت نسبة غيابه 25٪، وذلك وفق شروط المادة (8) من هذه اللائحة، حينئذ لا يرسب الطالب في المقرر ويحصل على تقدير منسحب (W).

المادة (13): سياسة تقييم المقررات

- توزع درجات المقرر (100 درجة) على تقييم أعمال الفصل الدراسي والامتحان النهائي بنسب تختلف وفق طبيعة المقرر، ويجب إعلام الطلاب بسياسة تقييم المقرر من خلال توصيف المقرر المعلن في بداية الفصل الدراسي. وتخضع غالبية المقررات لنموذج توزيع الدرجات التالي:

1. الامتحان النهائي

يكون الامتحان النهائي شاملا لجميع موضوعات المقرر ويقيم من 40 درجة،

2. الامتحان النصفي

يقيم امتحان منتصف الفصل الدراسي من 20 إلى 30 درجة، ويتم إجراؤه في الفترة من الأسبوع السابع حتى التاسع من الفصل الدراسي الرئيسي، وبعد إجرائه يجب شرح إجابته النموذجية للطلاب في الفصل.

3. مكونات التقييم الأخرى

تشمل مكونات التقييم الأخرى، والتي تشكل من 30 إلى 40 درجة، ما يلي: الاختبارات القصيرة، والتكليفات، والامتحانات العملية (إن وجدت)، والامتحانات الشفوية (إن وجدت)، وتقرير / مشروع المقرر (إن وجد)، وأداء الطالب ومشاركاته، على ألا تزيد درجات النشاط الدراسي الواحد عن 30 درجة.

- يمكن تعديل توزيع درجات المقرر بعد موافقة مجلس الكلية بناء على اقتراح القسم العلمي الذي يطرح المقرر.

المادة (14): تقدير المقررات

- هناك شرطان للنجاح في مقرر اعتيادي:

1. أن يحضر الطالب الامتحان النهائي ويحصل على ما لا يقل عن 40٪ من نهايته العظمى.
2. يجب أن يكون إجمالي الدرجات التي يحصل عليها الطالب في المقرر 60 درجة على الأقل من أصل 100 درجة.

- أما بالنسبة للمقررات التي لا يحتسب لها ساعات معتمدة (0 ساعة معتمدة)، يكون تقدير المقرر إما ناجح أو راسب (P / F)، وتقدير ناجح معناه حصول الطالب على 60٪ على الأقل من درجات المقرر، ولا يتم تضمين درجة هذه المقررات في حساب المعدل التراكمي.

- تتبنى هذه اللائحة النظام التالي لتقديرات المقررات:

التقدير	إجمالي الدرجة كنسبة مئوية	النقاط	التقدير	إجمالي الدرجة كنسبة مئوية	النقاط
A+	من 97% حتى 100%	4.0	C+	من 73% حتى أقل من 76%	2.3
A	من 93% حتى أقل من 97%	4.0	C	من 70% حتى أقل من 73%	2.0
A-	من 89% حتى أقل من 93%	3.7	C-	من 67% حتى أقل من 70%	1.7
B+	من 84% حتى أقل من 89%	3.3	D+	من 64% حتى أقل من 67%	1.3
B	من 80% حتى أقل من 84%	3.0	D	من 60% حتى أقل من 64%	1.0
B-	من 76% حتى أقل من 80%	2.7	F	أقل من 60%	0.0

- بالإضافة إلى ما سبق، هناك مجموعة من التقديرات الإضافية:

التقدير	المعنى	التوصيف
P/F	ناجح / راسب	تقديرات المقررات التي لا يحتسب لها ساعات معتمدة
W	منسحب	وفق شروط المادة (9)
I	غير مكتمل	وفق شروط المادة (10)

المادة (15): امتحان الإعادة

يجوز السماح للطالب الراسب في مقرر دراسي (حصل على تقدير F) بإعادة الامتحان النهائي للمقرر في نفس الفصل الدراسي خلال اسبوعين من انتهاء الامتحانات النهائية وفقاً للقواعد التالية:

1- ألا تقل درجة الطالب في المقررعن 55% من إجمالي درجات المقرر بشرط ألا تقل درجة الامتحان النهائي عن 50% من نهايته العظمى.

2- ألا يزيد تقدير الطالب في المقرر بعد الإعادة عن 1.7 (-C).

3- في حالة عدم حصول الطالب على درجة تمكنه من النجاح في المقررعليه إعادة المقرردراسة وامتحانا وفقا للمادة رقم (11) من هذه اللائحة.

4- لا يمنح الطالب هذه السماحية ألا لمقرردراسي واحد فقط في نفس الفصل الدراسي.

5- يظهرفي السجل الدراسي للطالب النتيجة النهائية للمقرربعد امتحان الإعادة.

المادة (16): التظلمات الطلابية

يمكن للطالب التقدم بطلب تظلم لمراجعة درجاته في مقرر خلال أسبوعين من تاريخ إعلان النتائج، وبعد سداد الرسوم المطلوبة وفقا للوائح الكلية. ويشكل القسم العلمي لجنة مراجعة تضم القائم بتدريس المقرر، وتقوم اللجنة بتدقيق درجات الطالب في ضوء التظلم ومن ثَم اتخاذ القرار المناسب بشأنه.

المادة (17): حساب المعدل التراكمي

- عدد نقاط المقرر هي حاصل ضرب نقاط التقدير الذي حصل عليه الطالب في المقرر مضروباً في عدد الساعات المعتمدة للمقرر.
- يتم حساب المعدل الفصلي (GPA) بقسمة إجمالي عدد نقاط المقررات التي تم تسجيلها في الفصل الدراسي على إجمالي عدد الساعات المعتمدة لها وذلك على النحو التالي:

$$GPA = \frac{\sum_{Semester\ Courses} Grade\ Points * Credit\ Hours}{\sum_{Semester\ Courses} Credit\ Hours}$$

- يتم حساب المعدل التراكمي (CGPA) بقسمة إجمالي عدد نقاط المقرر ات التي تمت محاولتها على إجمالي عدد الساعات المعتمدة لها، وذلك على النحو التالي:

$$GPA = \frac{\sum_{All\ Courses} Grade\ Points * Credit\ Hours}{\sum_{All\ Courses} Credit\ Hours}$$

المادة (18): وقف القيد

يجوز للطالب التقدم بطلب وقف القيد لفصل دراسي أو أكثر متضمنا الأسباب المانعة من الانتظام بالدراسة ومدعوماً بالمستندات ويقوم مجلس الكلية بدراسة الطلب لاتخاذ القرار المناسب على ألا تزيد مدد وقف القيد عن أربعة فصول دراسية رئيسية متتالية أو منفصلة طوال مدة الدراسة.

المادة (19) الإنذار الأكاديمي والفصل من الدراسة

- يحصل الطالب على إنذار أكاديمي إذا انخفض المعدل التراكمي له إلى أقل من 2.0.
- يفصل الطالب من الكلية في الحالات التالية:
  - إذا كان معدله التراكمي أقل من 1.0 بعد أول ثلاثة فصول دراسية رئيسية.
  - إذا كان معدله التراكمي أقل من 2.0 خلال ستة فصول دراسية رئيسية متتالية.
  - إذا لم يحقق الطالب متطلبات التخرج خلال الحد الأقصى المسموح به لمدة الدراسة.
- في حالات الفصل، يجوز للطالب أن يتقدم بطلب مواصلة الدراسة، مدعوماً بمستندات تخص ظروفه الاجتماعية و/ أو الصحية، ويقوم مجلس الكلية بدراسة الطلب لاتخاذ القرار المناسب، وبالنسبة للطالب الذي أنهى بنجاح 80٪ من متطلبات التخرج، يجوز لمجلس الكلية منحه فرصة أخيرة لمدة فصلين دراسيين رئيسيين متتاليين إضافيين بالإضافة إلى فصل الصيف لتحسين معدله التراكمي قبل فصله نهائيا.

المادة (20): مشروع التخرج

- يتكون مشروع التخرج من مقررين دراسيين (باستثناء برنامجي الهندسة المعمارية) يمتدا على الفصلين الدراسيين الرئيسيين للسنة النهائية من الدراسة، بالإضافة إلى فترة إضافية مدتها ثلاثة أسابيع بعد الامتحانات النهائية، ويتم تقييم كل مقرر منهما بشكل مستقل وفق نظام الساعات المعتمدة، ويحق للطالب تسجيل المقرر الأول من مشروع التخرج عند إكمال ما لا يقل عن 100 ساعة معتمدة.
- تُطبِق مشاريع التخرج ما حصله الطالب خلال الدراسة من المعرفة والمهارات الهندسية لحل وتصميم تطبيقات واقعية، ويتضمن الجزء الأول من المشروع مسحا مرجعيا لمجال موضوع المشروع باستخدام المراجع العلمية المناسبة، كما يتضمن الجدول الزمني لمراحل التصميم والتنفيذ للمشروع، ويمثل الجزء الثاني من المشروع مرحلة التصميم التي يتم فيها دمج العلوم الأساسية والرياضيات و العلوم الهندسية لاستخدام الموارد على النحو الأمثل بغرض تحقيق هدف معلن، ومن بين العناصر الأساسية لعملية التصميم وضع الأهداف والمعايير، والتوليف، والتحليل، والبناء، والاختبار ، والتقييم، ويجب على الطالب مراعاة المعايير والأكواد الهندسية المناسبة والقيود المتعددة خلال المراحل المختلفة للمشروع.

- يقوم المشرف بتقييم مساهمة كل طالب خلال المراحل المختلفة للمشروع. ويتم تقديم نسخة من تقرير المشروع إلى جانب المنتج النهائي لأعمال المشروع إلى القسم العلمي قبل تاريخ المناقشة، ويقوم أعضاء لجنة التحكيم من الجامعات والصناعة بتقييم عمل الطلاب بناء على تقرير المشروع، والمنتج النهائي، والعرض التقديمي الشفوي، والمناقشة.

المادة (21): التدريب العملي

التدريب العملي هو جزء من الخطة الدراسية لجميع البرامج الرئيسية بالكلية، وتبلغ المدة الإجمالية له 150 ساعة تدريبية، مقسمة على مقررين (75 ساعة تدريبية لكل منهما)، ويجرى التدريب في منشأة هندسية واحدة أو أكثر (داخل أو خارج مصر)، على أن يكون البرنامج التدريبي مرتبطا بتخصص البرنامج الرئيسي للطالب، ويتم اعتماده من القسم العلمي، ويكون الطالب مؤهلا لتسجيل المقرر التدريبي الأولى والثاني بعد إكمال ما لا يقل عن 54 ساعة معتمدة و90 ساعة معتمدة على التوالي، وبعد الانتهاء من كل وحدة تدريبية يقوم الطالب بتقديم تقرير، وتقديم عرض تقديمي ليتم تقييمه بواسطة القسم العلمي.

المادة (22): متطلبات منح الدرجة العلمية

- للحصول على درجة بكالوريوس العلوم (.B.Sc) في الهندسة، يجب على الطالب:
  - إكمال 144 ساعة معتمدة بنجاح بمعدل تراكمي (CGPA) لا يقل عن 2.0 (C).
  - النجاح في مشروع التخرج.
  - اجتياز التدريب العملي بنجاح.
- يمكن للطالب دراسة عدة مقررات في جامعة أخرى لديها اتفاقية تعاون مع جامعة المستقبل، وهذا يتطلب موافقة مسبقة من مجلس الكلية، ويتم تضمين الساعات المعتمدة لهذه المقررات في متطلبات تخرج الطالب ، بشرط ألا يتجاوز مجموع الساعات المعتمدة للمقررات التي تمت دراستها خارج الجامعة لعدد 72 ساعة معتمدة.

المادة (23): تقديرات التخرج ومرتبة الشرف

- ترتبط تقديرات التخرج بالمعدل التراكمي كما هو موضح في الجدول التالي.

المعدل التراكمي للتخرج CGPA	تقدير التخرج
$CGPA \geq 3.7$	ممتـــاز
$3.0 \leq CGPA < 3.7$	جيد جدا
$2.3 \leq CGPA < 3.0$	جيــــد
$2.0 \leq CGPA < 2.3$	مقبـــول

- لاستحقاق مرتبة الشرف، يجب على الطالب استيفاء الشروط التالية:
  - الحفاظ على معدل تراكمي لا يقل عن 3.3 طوال فترة دراسته في البرنامج الرئيسي،
  - عدم الرسوب في أي مقرر طوال فترة دراسته في البرنامج الرئيسي،
  - عدم توقيع عقوبة تأديبية عليه خلال مدة البرنامج.

المادة (24): البرامج الثانوية والمسارات

- يمثل البرنامج الثانوي (Minor) مجموعة من المقررات الدراسية التكميلية في تخصص مختار مُكَمِل لمجال الدراسة الرئيسي، وقد تمنح البرامج الثانوية الخريجين ميزة تنافسية إضافية لسوق العمل، وتتميز البرامج الثانوية بما يلي:
  - التسجيل في برنامج ثانوي ليس إلزامياً للحصول على درجة البكالوريوس في العلوم،
  - يجوز للطالب التسجيل في برنامج ثانوي أو أكثر بعد الانتهاء من 100 ساعة معتمدة، وذلك وفقا لمتطلبات التسجيل المنصوص عليها في الفصل التاسع من هذه اللائحة.
  - يتكون كل برنامج ثانوي من مجموعة من المقررات الإجبارية و/ أو الاختيارية بما مجموعه 18 ساعة معتمدة.

- يجوز للبرنامج الرئيسي (Major) توزيع مقرراته الاختيارية على عدة مسارات (Concentrations/Tracks) حيث يمثل كل مسار تخصصا فرعيا يندرج تحت التخصص العام للبرنامج، وسوف يتم ذكر عنوان المسار في السجل الأكاديمي (Transcript) للطالب إذا استوفى العدد المطلوب من المقررات / الساعات المعتمدة المحددة من قِبَل البرنامج الرئيسي ذي الصلة وفقا لهذه اللائحة.

المادة (25): تحديث اللوائح

يمكن لمجلس الكلية إجراء بعض التعديلات الطفيفة على هذه اللائحة دون الرجوع إلى لجنة قطاع الدراسات الهندسية - المجلس الأعلى للجامعات المصرية. وتشمل هذه التعديلات على سبيل المثال لا الحصر:

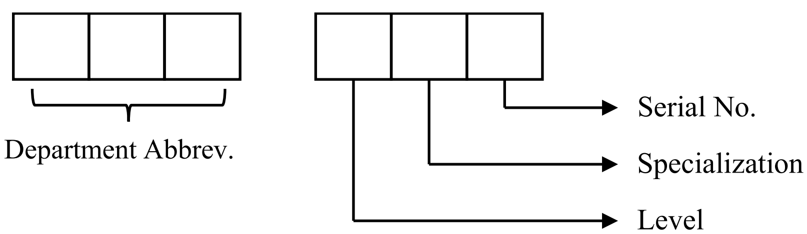
- إضافة المقررات الاختيارية للبرامج الرئيسية والفرعية،
- تعديل محتويات المقرر (بما لا يزيد عن 50٪)،
- تعديل المتطلب السابق للمقرر،
- تعديل توزيع درجات المقرر،
- تعديل ساعات الاتصال بمقرر دراسي دون تغيير ساعاته المعتمدة،
- تعديل المستوى الدراسي للمقرر.

المادة (26): أحكام عامة

- بعد صدور القرار الوزاري باعتماد اللائحة، يتم تطبيق اللائحة على الطلاب الجدد الذين سيتم قبولهم في الكلية اعتبارا من الفصل الدراسي الرئيسي التالي لاعتماد اللائحة، وكذلك على الطلاب المسجلين بالفعل في الكلية والذين أنجزوا عدد 40 ساعة معتمدة أو أقل وقت صدور القرار الوزاري وذلك بشرط إجراء المقاصة اللازمة، ويجوز لمجلس الكلية إضافة فئات طلابية أخرى إلى ما سبق بناءً على دراسة يجريها وكيل الكلية لشؤون التعليم والطلاب، وذلك بغرض التنفيذ الأمثل لأحكام هذه اللائحة.
- يمكن لأي طالب مسجل في الكلية وقت صدور القرار الوزاري، وبشرط ألا تزيد الساعات المعتمدة التي أنجزها عن 72 ساعة، التقدم بطلب إلى العميد للتحويل إلى هذه اللائحة، ويعرض الطلب على لجنة شئون التعليم والطلاب لإبداء الرأي وعلى مجلس الكلية للموافقة عليه واعتماده ويتم إجراء المقاصة العلمية اللازمة.
- تطبق القواعد الخاصة بالمقاصة العلمية على أساس المحتوي العلمي للمقررات عند التحويل من لائحة سابقة الى هذه اللائحة.

المادة (27): نظام تكويد المقررات

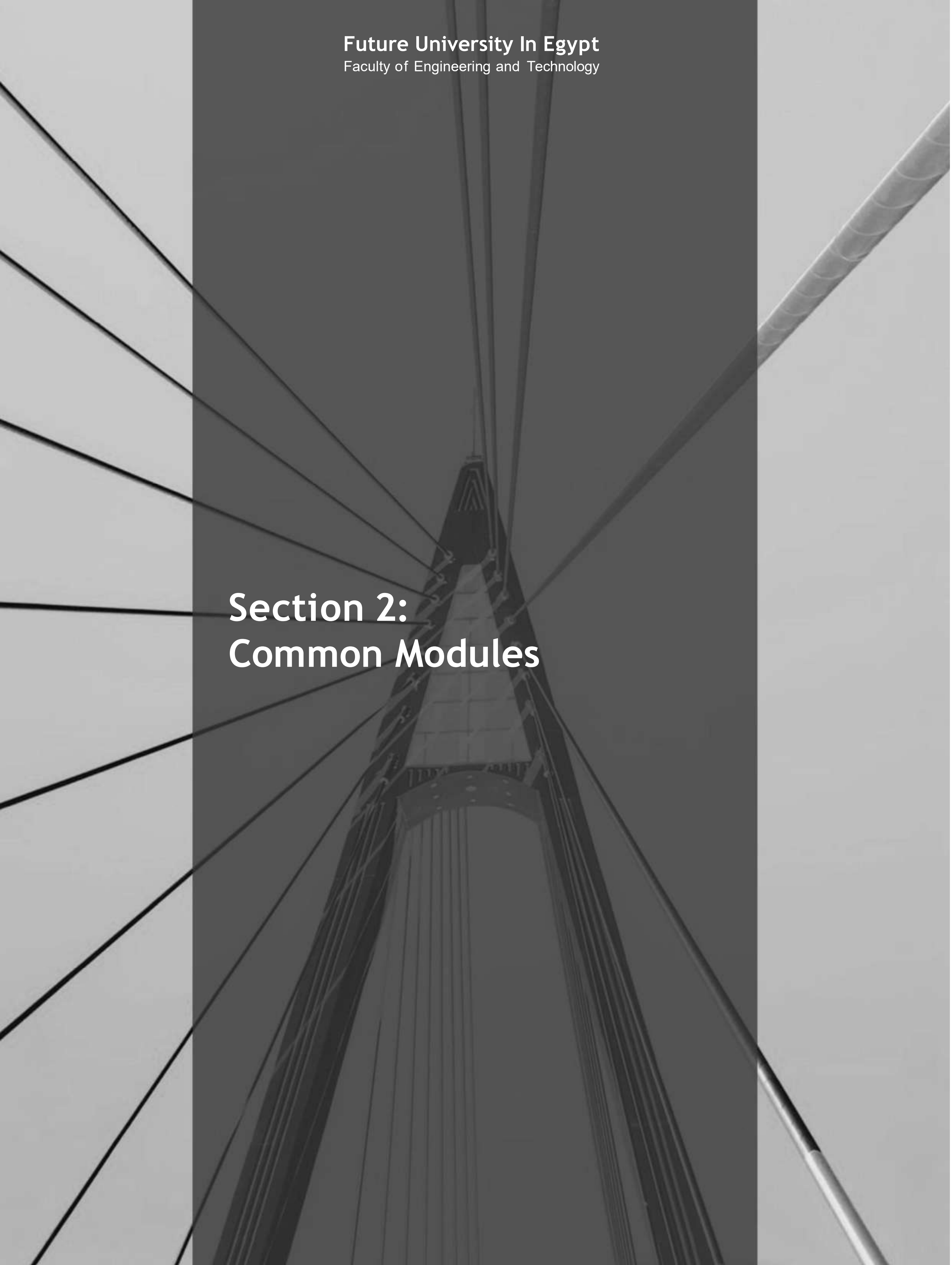
يبدأ كود المقرر بالرمز الخاص بالقسم من ثلاثة حروف حسب الجدول أدناه متبوعا ب ثلاثة أرقام: المستوى الدراسي، ورقم مجال التخصص، والرقم التسلسلي للمقرر.



الرموز الخاصة بالأقسام العلمية

#	القسم العلمي	الرمز
1	قسم الهندسة المعمارية	ARC
2	قسم الهندسة الطبية	BME
3	قسم الهندسة الكهربائية	EED
4	قسم الرياضيات والفيزياء الهندسية	EMP
5	قسم الهندسة الميكانيكية	MEC
6	قسم هندسة البترول	PET

7	قسم الهندسة الإنشائية وإدارة التشييد	SCM
8	مقررات للكلية لا تطرح من أي من الأقسام العلمية ويتم إدارتها بواسطة وكيل الكلية للتعليم والطلاب	GEN
9	مقررات الجامعة تطرح من أقسام من كليات أخرى ويتم إدارتها بواسطة وكيل الكلية للتعليم والطلاب	ENG, UNV



Section 2: Common Modules

2. COMMON MODULES

2.1. Graduate Competencies (Program Outcomes) Common to All Programs

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

2.2. Overall Data of the Programs

<table>
<tr><th rowspan="2"></th><th rowspan="2">Study Program</th><th rowspan="2">NC</th><th colspan="3">Credits and SWL</th><th colspan="4">Program Contact Hrs</th><th colspan="4">Program Requirements</th><th rowspan="2">BS</th><th rowspan="2">EC*</th></tr>
<tr><th>CH</th><th>SWL</th><th>ECTS</th><th>Lec</th><th>Tut</th><th>Lab</th><th>TT</th><th>UR%</th><th>FR%</th><th>DR%</th><th>PR%</th></tr>
<tr><td>1</td><td>Architectural Engineering (ARE)</td><td>55</td><td>144</td><td>6000</td><td>240</td><td>77</td><td>127</td><td>15</td><td>219</td><td rowspan="10">8%</td><td rowspan="10">21%</td><td rowspan="2">42%</td><td rowspan="2">29%</td><td rowspan="2">13%</td><td rowspan="2">19%</td></tr>
<tr><td>2</td><td>Interior Architecture Engineering (IAE)</td><td>56</td><td>144</td><td>6000</td><td>240</td><td>75</td><td>129</td><td>15</td><td>219</td></tr>
<tr><td>3</td><td>Electrical Power Engineering (EPE)</td><td>53</td><td>144</td><td>6000</td><td>240</td><td>99</td><td>80</td><td>35</td><td>214</td><td rowspan="4">42%</td><td rowspan="4">29%</td><td rowspan="4">21%</td><td rowspan="4">16%</td></tr>
<tr><td>4</td><td>Electronics and Communication Engineering (ECE)</td><td>53</td><td>144</td><td>6000</td><td>240</td><td>99</td><td>72</td><td>46</td><td>217</td></tr>
<tr><td>5</td><td>Computer and Intelligent Systems Engineering (CIS)</td><td>53</td><td>144</td><td>6000</td><td>240</td><td>99</td><td>66</td><td>50</td><td>215</td></tr>
<tr><td>10</td><td>Biomedical Engineering (BME)</td><td>53</td><td>144</td><td>6000</td><td>240</td><td>99</td><td>77</td><td>36</td><td>212</td></tr>
<tr><td>6</td><td>Mechatronics Engineering (MEC)</td><td>55</td><td>144</td><td>6000</td><td>240</td><td>98</td><td>84</td><td>32</td><td>214</td><td rowspan="2">42%</td><td rowspan="2">29%</td><td rowspan="2">19%</td><td rowspan="2">16%</td></tr>
<tr><td>7</td><td>Sustainable Energy Engineering (SEE)</td><td>55</td><td>144</td><td>6000</td><td>240</td><td>98</td><td>90</td><td>24</td><td>212</td></tr>
<tr><td>8</td><td>Structural Engineering & Construction Management (SCM)</td><td>53</td><td>144</td><td>6000</td><td>240</td><td>98</td><td>86</td><td>22</td><td>206</td><td>52%</td><td>19%</td><td>19%</td><td>16%</td></tr>
<tr><td>9</td><td>Petroleum Engineering (PET)</td><td>54</td><td>144</td><td>6000</td><td>240</td><td>99</td><td>78</td><td>33</td><td>210</td><td>42%</td><td>29%</td><td>17%</td><td>16%</td></tr>
</table>

**Elective courses include: University electives = 6 CH, Faculty Elective = 2 CH, Program Electives = 15 CH except Architecture Programs = 20 CH*

CH	Total Credit Hours /program
ECTS	European Credit Transfer System / program
SWL	Total Student Workload / program
Lec	Total Lecture hours / program
Tut	Tutorial hours / program
Lab	Laboratory hours / program
TT	Total contact hours / program
NC	Total number of Courses / program *(including training)*
UR	University Requirement
FR	Faculty Requirement
DR	Discipline Requirement
PR	Program Requirement
BS	Basic Sciences Percentage
EC	Elective Courses Percentage, by Credit Hours

2.3. Basic Science Courses Per Program

Basic Science Courses			Major Programs									
Code	Title	CH	ARE	IAE	EPE	ECE	CIS	MEC	SEE	SCM	PET	BME
EMP113	Calculus I	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EMP114	Calculus II	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EMP115	Probability & Statistics	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EMP123	Physics I	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EMP124	Physics II	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EMP151	General Chemistry	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EMP213	Differential Equations	3			✓	✓	✓	✓	✓	✓	✓	✓
EMP214	Transformations & Complex Analysis	3			✓	✓	✓	✓	✓			✓
EMP216	Discrete Mathematics & Numerical Methods	3			✓	✓	✓					✓
EMP217	Linear Algebra & Geometry	3						✓	✓			
EMP225	Waves and Vibrations	3								✓		
EMP227	Solid State Physics	3			✓	✓	✓					✓
EMP251	Organic Chemistry	3									✓	
EMP411	Numerical Method	3								✓		
EMP226	Materials Science	2						✓	✓			
Basic Science Courses per Program in CH			18	18	30	30	30	29	29	27	24	30
Basic Science Courses in % of Overall Program CH			13%	13%	21%	21%	21%	20%	20%	19%	17%	21%
Complying with TOR Requirements?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

2.4. University Requirements

(12 credit hours)

2.4.1. Compulsory Courses List

(6 credit hours)

#	Code	Course Title	CH
1	ENG KET	English KET	**2**
2	ENG PET	English PET	**2**
3	PSC 110	Human Rights	**2**
		Subtotal	**6**

2.4.2. Elective Courses List

(6 credit hours)

Three Courses (UNV E01, UNV E02, and UNV E03) are to be selected from this list

#	Code	Course Title	CH
1	CPS 101	Communication and Presentation Skills	**2**
2	CSC 101	Introduction to Computer	**2**
3	ENV 101	Environmental Science	**2**
4	PSY 101	Psychology	**2**
5	SCT 101	Scientific Thinking	**2**
6	SOC 101	Sociology	**2**

2.5. Faculty Requirements

(30 credit hours)

2.5.1. Faculty Compulsory Courses List

(28 credit hours)

#	Code	Course Title	CH
1	EED161	Computer Programming	**3**
2	EMP113	Calculus I	**3**
3	EMP114	Calculus II	**3**
4	EMP115	Probability & Statistics	**3**
5	EMP123	Physics I	**3**
6	EMP124	Physics II	**3**
7	EMP131	Engineering Mechanics	**3**
8	EMP141	Engineering Drawing	**2**
9	EMP151	General Chemistry	**3**
10	GEN211	Practical Training 1	**0**
11	GEN311	Practical Training 2	**0**
12	MEC151	Production Technology	**2**
		Subtotal	**28**

2.5.2. Faculty Elective Courses List

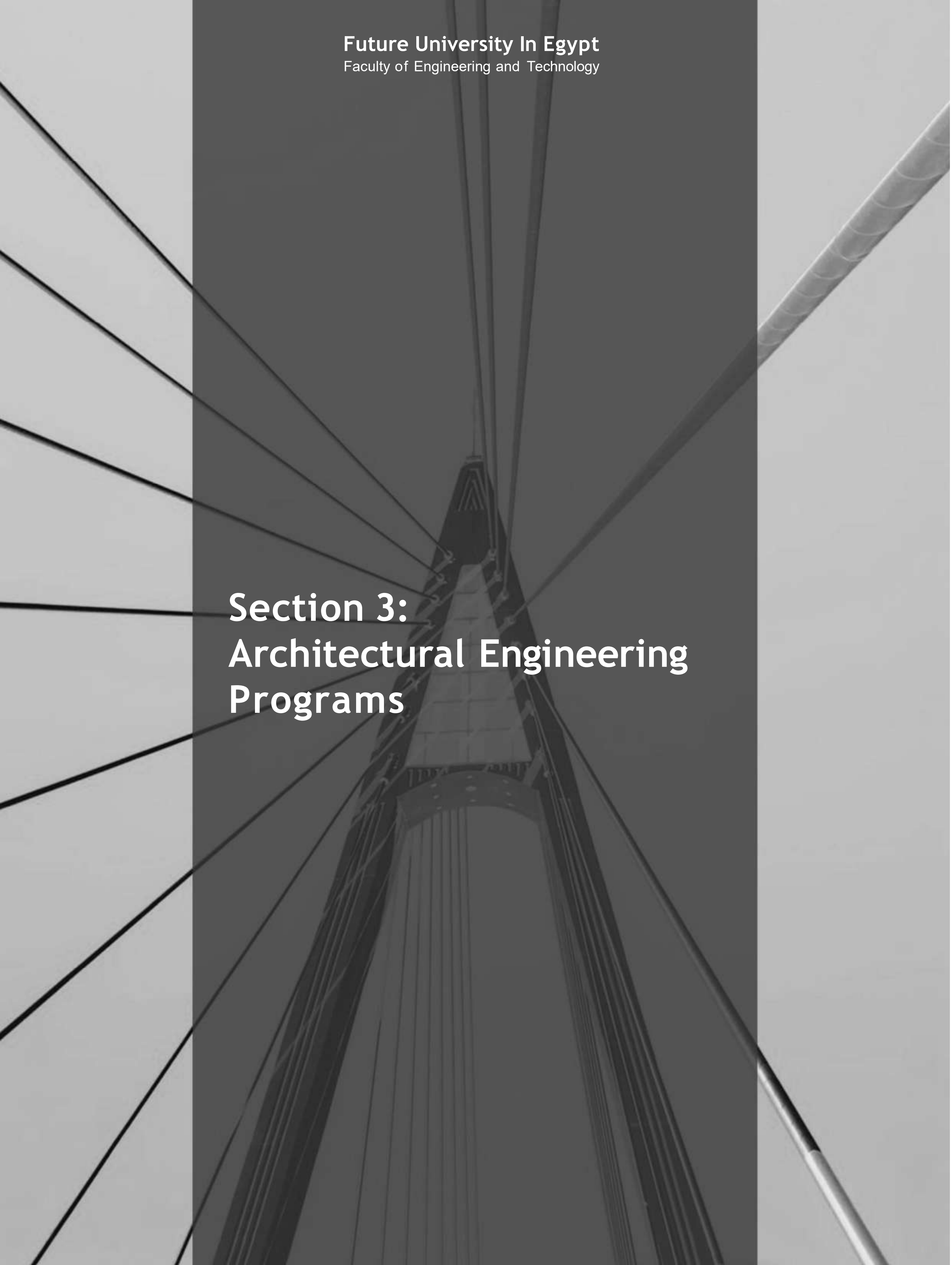
(2 credit hours)

One Course (FAC E1) is to be selected from this list

#	Code	Course Title	CH
1	ARC331	Engineering Ethics and Legislations	2
2	SCM381	Engineering Project Management	2
3	MEC391	Environmental Impact of Engineering Projects	2

2.7. Common Courses versus General Graduate Competencies (Program Outcomes)

	University and Faculty Courses		Common Graduate Competencies									
	Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
Univ. Require.	ENG KET	English KET										
	ENG PET	English PET										
	PSC 110	Human Rights										
Faculty Requirements	EED161	Computer Programming										
	EMP113	Calculus I										
	EMP114	Calculus II										
	EMP115	Probability & Statistics										
	EMP123	Physics I										
	EMP124	Physics II										
	EMP131	Engineering Mechanics										
	EMP141	Engineering Drawing										
	EMP151	General Chemistry										
	GEN211	Practical Training 1										
	GEN311	Practical Training 2										
	MEC151	Production Technology										



Section 3: Architectural Engineering Programs

3. ARCHITECTURAL ENGINEERING DEPARTMENT MAJOR PROGRAMS

3.0 Architectural Engineering Course Coding

A	**R**	**C**		**x**	

x → Specialization

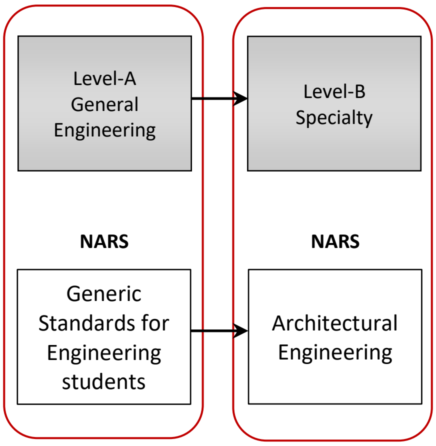
x	Specialization
1	Architectural Design
2	History/Theory
3	Graphics/Computers
4	Building Construction
5	Urban Planning/Design/Landscape
6	Environmental Control
7	Execution Designs
8	Project Management/Building Laws
9	Graduation Project/Studies

3A. ARCHITECTURAL ENGINEERING (ARE) PROGRAM

3A.1. ARE Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Architectural Engineering program.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)



Different Levels of Competencies, as per NAQAAE

Also, the development of the program considers the conditions and constraints specified by the Validation Board for the International Union of Architects (UIA).

3A.2. ARE Graduate Attributes

The graduate of the architectural engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

3A.3 ARE Program Outcomes *(Levels A, & B)*

The architectural engineering graduate must be able to:

General Outcomes for ARE Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies

Specialization Outcomes for ARE Program (Level B - Architectural engineering)

PO11. Create architectural, urban and planning designs that satisfy both aesthetic and technical requirements, using adequate knowledge of history and theory, related fine arts, local culture and heritage, technologies and human sciences.

PO12. Produce designs that meet building users' requirements through understanding the relationship between people and buildings, and between buildings and their environment; and the need to relate buildings and the spaces between them to human needs and scale.

PO13. Generate ecologically responsible, environmental conservation and rehabilitation designs; through understanding of structural design, construction, technology and engineering problems associated with building designs.

PO14. Transform design concepts into buildings and integrate plans into overall planning within the constraints of project financing, project management, cost control and methods of project delivery; while having adequate knowledge of industries, organizations, regulations and procedures involved.

PO15. Prepare design project briefs and documents and understand the context of the architect in the construction industry, including the architect's role in the processes of bidding, procurement of architectural services and building production.

3A.4. ARE Program Graduation Requirements

ARE Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4)*	30	21%
ARE Specialty Requirements *(sub-section 3A.5.)*	61	42%
ARE Sub-Specialty Requirements *(sub-section 3A.6.)*	41	29%
Total	144	100%

3A.5. Architectural Engineering Specialty Requirements *(61 CH)*

No.	Code	Course Title	CH
1	ARC121	History & Theories of Architecture (1)	2
2	ARC131	Graphics & Visual Skills	2
3	ARC213	Architectural Design (1)	4
4	ARC214	Architectural Design (2)	4
5	ARC221	History & Theories of Architecture (2)	2
6	ARC231	Computer-Aided Drafting	2
7	ARC243	Building Construction & Materials (1)	3
8	ARC244	Building Construction & Materials (2)	3
9	ARC253	Landscape Architecture	3
10	ARC271	Building Information Modeling (BIM)	2
11	ARC281	Buildings' Laws & Regulations	2
12	ARC315	Architectural Design (3)	4
13	ARC332	Computer Applications	2
14	ARC347	Building Construction & Materials (3)	4
15	ARC362	Environmental Control, Acoustics, lighting systems and Technical Installations	3
16	ARC491	Graduation Project studies	2
17	ARC492	Graduation Project	5
18	SCM218	Steel Structure for Architects	2
19	SCM219	Properties & Strength of Materials	2
20	SCM355	Reinforced Concrete & Foundations for Architects	2
21	ARC326	History & Theories of Architecture (3)	2
22	ARC374	Execution Design	4
		Subtotal	61

3A.6. Architectural Engineering Sub-Specialty Requirements *(41 CH)*

3A.6.1 ARE Compulsory Courses List *(21 CH)*

No.	Code	Course Title	CH
1	ARC316	Architectural Design (4)	4
2	ARC352	Urban Planning	3
3	ARC355	Urban Design & Housing	4
4	ARC411	Architectural Design (5)	4
5	ARC472	Building Technology (1)	3
6	ARC473	Building Technology (2)	3
		Subtotal	21

3A.6.2. ARE Elective Courses Lists / Concentrations *(20 CH)*

The student has to select 8 courses from the following lists: 4 courses of 3 CH each (A type) and 4 courses of 2 CH each (B type). If the student studies at least 12 CH from one of the lists, the relevant concentration title will be mentioned in his transcript.

Concentration 1: Architecture and Environment

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC363	Material Studies & Environmental Design	B	2	--
2	ARC463	Zero-Plus Energy Buildings	A	3	--
3	ARC364	Climate, Energy, & Architecture	B	2	--
4	ARC461	Environmental & Building Performance	A	3	--
5	ARC465	Environmental Architecture Design Techniques	A	3	--
6	ARC466	Special Topics in Environmental Design	B	2	--

Concentration 2: Furniture Design

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC311	Special Topics in Furniture Design	B	2	--
2	ARC321	Furniture Designers and Brands	B	2	--
3	ARC324	Furniture Mockups (Colors & Materials)	B	2	--
4	ARC375	Furniture Design	A	3	--
5	ARC431	Visualizing Furniture: Design & Drawings	A	3	--
6	ARC432	Digital Fabrication for Furniture Design	B	2	--
7	ARC441	Built-in Cabinet, Lighting & Styling	A	3	--
8	ARC471	Furniture Production and Technical Drawings	A	3	--

Concentration 3: Construction Technology

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC335	Virtual Augmented Reality & Artificial Intelligence	B	2	--
2	ARC342	Sustainable Technology	B	2	--
3	ARC433	BIM & 4D Simulation	A	3	--
4	ARC434	Innovative 3D printing Applications	A	3	--
5	ARC443	Prefabrication & Modular Construction	A	3	--
6	ARC444	Special Topics in Construction Technology	B	2	--

Concentration 4: Urban Design

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC323	Upgrading & Conservation	B	2	--
2	ARC325	Special Topics in Urban Design	B	2	--
3	ARC412	Visual Image Design	A	3	--
4	ARC424	Affordable Housing and Community Development	A	3	--
5	ARC426	Smart Cities and the Future of Transport Systems	B	2	--
6	ARC451	Landscape & Site Planning	A	3	--
7	ARC452	Detailed Neighborhood Design	B	2	--
8	ARC453	Designing Urban Spaces	A	3	--

Concentration 5: Sustainable Urban Mobility Planning

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC327	Special Topics in Sustainable Urban Mobility Planning	B	2	--
2	ARC426	Smart Cities and the Future of Transport Systems	B	2	--
3	ARC436	Geographic Information System (GIS)	A	3	--
4	ARC454	Sustainable Urban Mobility and Green Energy	B	2	--
5	ARC455	City Planning and Urban Mobility	A	3	--
6	ARC456	Transportation and Land Use Planning	A	3	--

Concentration 6: Landscape Architecture

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC328	Histories of Landscape Architecture	B	2	--
2	ARC357	Landscape Planting Design	B	2	--
3	ARC429	Healing Landscape	A	3	--
4	ARC445	Landscape Construction Design	A	3	--
5	ARC451	Landscape & Site Planning	A	3	--
6	ARC458	Special Topics in Landscape Architecture	B	2	--
7	ARC459	Reading the Contemporary Landscape	A	3	--

Concentration 7: Architecture with GIS

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC337	Introduction to Building Information Modeling (BIM) and Geographic Information Systems (GIS)	B	2	--
2	ARC338	Digital Twin Applications in Architecture and Urbanism using GIS and BIM [GeoBIM]	B	2	--
3	ARC439	Special topics in GIS & BIM	B	2	--
4	ARC481	Geospatial Analysis for Risk and Performance Management in Architecture	A	3	--
5	ARC482	Integrated Project Coordination and Site Management Using GIS & BIM [GeoBIM]	A	3	--
6	ARC483	GeoBIM for Sustainable Development Goals (SDGs): Asset and Facilities Management	A	3	--

Concentration 8: Interior Design

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC322	History & Theories of Interior Design	B	2	--
2	ARC361	Interior Design with Light and Sound	A	3	--
3	ARC376	Interior Design Styles and Trends	B	2	--
4	ARC415	Residential and Hospitality Interior Design	A	3	--
5	ARC414	Applied Project in Interior Design*	C	5	--
6	ARC471	Furniture Production and Technical Drawings	A	3	--

** This course is equivalent to 2 regular courses: one type A-course (3 CH) + one type B-course (2 CH)*

3A.7. ARE Program Study Plan

Level 1 (Freshman)

First Semester

Common to All Engineering Students

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	--
2	EMP123	Physics I	**3**	5	125	2	2	1	5	--
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	--
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	--
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	--
6	ENG KET	English KET	**2**	3	75	2	0	0	2	--
7	PSC 110	Human Rights	**2**	3	75	2	0	0	2	--
		Total	**18**	30	750	13	9	3	25	

Second Semester

(Common to All Architectural Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	ARC121	History & Theories of Architecture (1)	**2**	3	75	2	0	0	2	--
2	ARC131	Graphics & Visual Skills	**2**	4	100	1	3	0	4	--
3	EED161	Computer Programming	**3**	5	125	2	0	2	4	--
4	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
5	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
6	EMP124	Physics II	**3**	5	125	2	2	1	5	--
7	MEC151	Production Technology	**2**	3	75	1	0	3	4	--
		Total	**18**	30	750	12	9	6	27	

Level 2 (Sophomore)

Third Semester

(Common to All Architectural Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC213	Architectural Design (1)	**4**	6	150	1	6	0	7	ARC121
2	ARC221	History & Theories of Architecture (2)	**2**	3	75	2	0	0	2	--
3	ARC231	Computer-Aided Drafting	**2**	4	100	1	0	2	3	--
4	ARC243	Building Construction & Materials (1)	**3**	5	125	1	5	0	6	--
5	ARC281	Building' Laws & Regulations	**2**	4	100	1	2	0	3	--
6	SCM218	Steel Structure for Architects	**2**	4	100	1	2	0	3	--
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	--
		Total	**17**	29	725	9	15	2	26	

Fourth Semester

(Common to All Architectural Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC214	Architectural Design (2)	**4**	6	150	1	6	0	7	ARC213
2	ARC244	Building Construction & Materials (2)	**3**	5	125	1	4	0	5	ARC243
3	ARC253	Landscape Architecture	**3**	5	125	2	3	0	5	--
4	ARC271	Building Information Modeling (BIM)	**2**	4	100	1	0	2	3	--
5	ENG PET	English PET	**2**	3	75	2	0	0	2	--
6	SCM219	Properties & Strength of Materials	**2**	4	100	1	2	0	3	--
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	--
		Total	**18**	30	750	10	15	2	27	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Contact Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Architectural Engineering Sub-Specialty Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC315	Architectural Design (3)	**4**	6	150	1	6	0	7	ARC213 & ARC281
2	ARC326	History & Theories of Architecture (3)	**2**	4	100	2	0	0	2	--
3	ARC347	Building Construction & Materials (3)	**4**	6	150	1	6	0	7	ARC243
4	ARC352	Urban Planning	**3**	5	125	2	2	0	4	--
5	ARC362	Environmental Control, Acoustics, lighting systems and Technical Installations	**3**	5	125	1	4	0	5	--
6	SCM355	Reinforced Concrete & Foundations for Architects	**2**	4	100	1	2	0	3	--
		Total	**18**	30	750	8	20	0	28	

Sixth Semester

(Architectural Engineering Sub-Specialty Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC316	Architectural Design (4)	**4**	6	150	1	6	0	7	ARC213
2	ARC332	Computer applications	**2**	4	100	1	0	2	3	EED161
3	ARC355	Urban Design & Housing	**4**	6	150	2	4	0	6	--
4	ARC374	Execution Design	**4**	6	150	2	4	0	6	ARC243
5	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3A.6.2
6	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3A.6.2
		Total	**18**	30	750	8	18	2	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Contact Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Architectural Engineering Sub-Specialty Students)

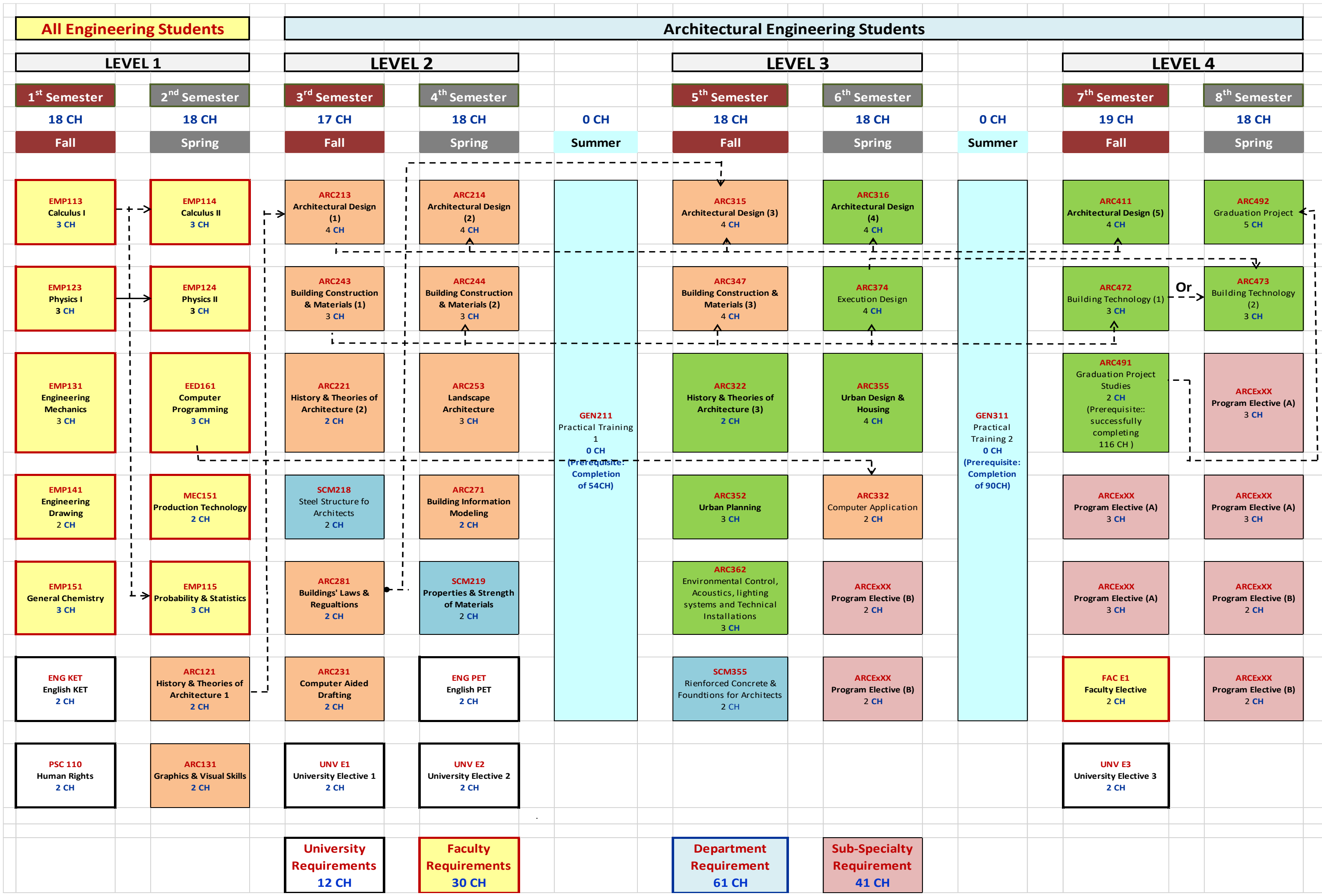
#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC411	Architectural Design (5)	**4**	6	150	1	6	0	7	ARC213
2	ARC472	Building Technology (1)	**3**	5	125	2	2	0	4	ARC243
3	ARC491	Graduation Project studies	**2**	4	100	1	2	0	3	successfully completing 116 CH
4	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3A.6.2
5	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3A.6.2
6	FAC E1	Faculty Elective	**2**	3	75	2	0	0	2	--
7	UNV E3	University Elective 3	**2**	3	75	2	0	0	2	--
		Total	**19**	31	775	10	18	0	28	

Eighth Semester

(Architectural Engineering Sub-Specialty Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC473	Building Technology (2)	**3**	5	125	2	2	0	4	ARC374 or ARC472
2	ARC492	Graduation Project	**5**	7	175	1	7	0	8	ARC491
3	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3A.6.2
4	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3A.6.2
5	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3A.6.2
6	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3A.6.2
		Total	**18**	30	750	7	21	0	28	

3A.8. ARE Program Courses' Tree Diagram



3A.9. ARE Program Courses Mapped to Program Outcomes (Competencies)

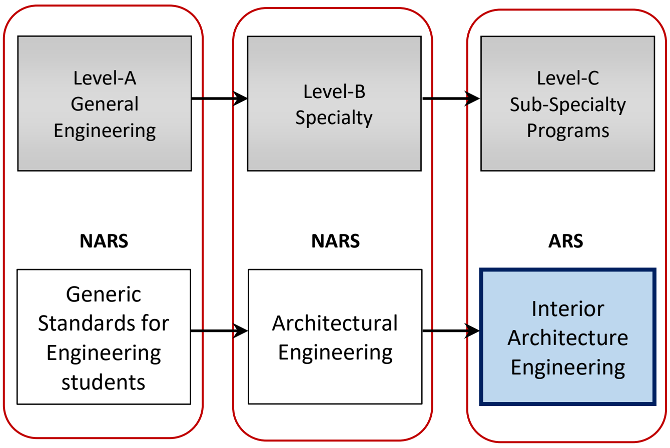
Code	Course Title	(Level A - Engineering)										Level B Architecture engineering				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
ARC121	History & Theories of Architecture (1)	■				■		■				■	■			■
ARC131	Graphics & Visual Skills	■	■						■	■		■	■			
ARC213	Architectural Design (1)	■	■	■		■			■	■		■	■	■	■	■
ARC214	Architectural Design (2)	■	■	■		■			■	■		■	■	■	■	■
ARC221	History & Theories of Architecture (2)	■				■		■				■	■			■
ARC231	Computer-Aided Drafting	■	■		■				■	■						
ARC243	Building Construction & Materials (1)	■	■	■	■	■							■	■	■	
ARC244	Building Construction & Materials (2)	■	■	■	■	■							■	■	■	
ARC253	Landscape Architecture		■			■	■	■	■	■	■	■	■			■
ARC271	Building Information Modeling (BIM)	■	■		■		■								■	
ARC281	Building' Laws & Regulations	■	■	■	■						■		■	■	■	■
ARC315	Architectural Design (3)	■	■	■		■	■	■	■	■		■	■	■		
ARC316	Architectural Design (4)	■	■	■		■	■	■	■	■	■	■	■	■		
ARC326	History & Theories of Architecture (3)	■				■		■				■				
ARC332	Computer Applications	■	■		■				■	■						
ARC347	Building Construction & Materials (3)	■	■	■										■	■	
ARC352	Urban Planning	■	■	■		■	■	■			■	■				
ARC355	Urban Design & Housing	■	■	■		■	■	■			■	■	■	■		
ARC362	Environmental Control, Acoustics, lighting systems and Technical Installations	■	■	■	■	■	■	■						■		■
ARC374	Execution Design	■	■	■	■		■									■
ARC411	Architectural Design (5)	■	■	■		■		■	■	■	■	■	■	■		
ARC472	Building Technology (1)	■	■			■	■							■	■	■
ARC473	Building Technology (2)	■	■	■		■	■				■			■	■	■
ARC491	Graduation Project studies	■	■			■		■	■	■	■		■	■		
ARC492	Graduation Project	■	■	■			■		■	■	■	■	■	■	■	
SCM218	Steel Structure for Architects	■	■	■			■					■	■	■	■	
SCM219	Properties & Strength of Materials	■	■	■			■					■	■	■	■	
SCM355	Reinforced Concrete & Foundations for Architects	■	■	■	■									■		

3B. INTERIOR ARCHITECTURE ENGINEERING (IAE) PROGRAM

3B.1. IAE Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Architectural Engineering program, and the Academic Reference Standard (ARS) for the "***Interior Architecture Engineering***" program, developed by the Faculty.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)
AND ACADEMIC REFERENCE STANDARDS (**ARS**)



Different Levels of Competencies, as per NAQAAE.

Also, it considers the Professional Standards of January 2020 of the Council for Interior Design Accreditation (CIDA) located in the USA and internationally, which is a recognized accredited body by the Council for Higher Education Accreditation (CHEA); an International highly respected entity that provides oversight for accrediting bodies through a recognition process.

3B.2. IAE Graduate Attributes

The graduate of the Interior architecture engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

3B.3. IAE Program Outcomes *(Levels A, B, &C)*

The interior architectural engineering graduate must be able to:

General Outcomes for IAE Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies

Specialization Outcomes for IAE Program (Level B - Architectural engineering)

PO11. Create architectural, urban and planning designs that satisfy both aesthetic and technical requirements, using adequate knowledge of history and theory, related fine arts, local culture and heritage, technologies and human sciences.

PO12. Produce designs that meet building users' requirements through understanding the relationship between people and buildings, and between buildings and their environment; and the need to relate buildings and the spaces between them to human needs and scale.

PO13. Generate ecologically responsible, environmental conservation and rehabilitation designs; through understanding of structural design, construction, technology and engineering problems associated with building designs.

PO14. Transform design concepts into buildings and integrate plans into overall planning within the constraints of project financing, project management, cost control and methods of project delivery; while having adequate knowledge of industries, organizations, regulations and procedures involved.

PO15. Prepare design project briefs and documents and understand the context of the architect in the construction industry, including the architect's role in the processes of bidding, procurement of architectural services and building production.

Specialization Outcomes for IAE Program (Level C – Interior Architecture engineering)

PO16. Understand interior construction and its interrelationship with the building construction and systems, and have a global understanding of the principles, processes, and responsibilities that define the profession and the value of interior design to society.

PO17. Employ all aspects of the design process and apply knowledge of human experience and behavior to creatively design the built environment and solve design problems.

PO18. Consider social, cultural, economic, and ecological contexts in all aspects of his/her work by being knowledgeable about the history of interiors, architecture, decorative arts, art, apply the principles and theories of light and color effectively, integrate furnishings, products, materials, and finishes, and use the principles of acoustics, thermal comfort, indoor air quality, water and wastewater systems in relation to environmental impact and human wellbeing.

PO19. Apply laws, codes, standards, and guidelines that impact human experience of interior spaces.

3B.4. IAE Program Graduation Requirements

ARE Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4)*	30	21%
ARE Specialty Requirements *(sub-section 3B.5.)*	60	42%
IAE Sub-Specialty Requirements *(sub-section 3B.6.)*	42	29%
Total	144	100%

3B.5. Architectural Engineering Specialty Requirements *(50 CH)*

No.	Code	Course Title	CH
1	ARC121	History & Theories of Architecture (1)	2
2	ARC131	Graphics & Visual Skills	2
3	ARC213	Architectural Design (1)	4
4	ARC214	Architectural Design (2)	4
5	ARC221	History & Theories of Architecture (2)	2
6	ARC231	Computer-Aided Drafting	2
7	ARC243	Building Construction & Materials (1)	3
8	ARC244	Building Construction & Materials (2)	3
9	ARC253	Landscape Architecture	3
10	ARC271	Building Information Modeling (BIM)	2
11	ARC281	Buildings' Laws & Regulations	2
12	ARC315	Architectural Design (3)	4
13	ARC332	Computer Applications	2
14	ARC347	Building Construction & Materials (3)	4
15	ARC362	Environmental Control, Acoustics, lighting systems and Technical Installations	3
16	ARC491	Graduation Project studies	2
17	ARC492	Graduation Project	5
18	SCM218	Steel Structure for Architects	2
19	SCM219	Properties & Strength of Materials	2
20	SCM355	Reinforced Concrete & Foundations for Architects	2
21	ARC322	History & Theories of Interior Design	2
22	ARC372	Interior Design Execution (1)	3
		Subtotal	60

3B.6. Interior Architecture Eng. Sub-Specialty Requirements *(42 CH)*

3B.6.1. IAE Compulsory Courses List *(22 CH)*

No.	Code	Course Title	CH
1	ARC312	Interior Design (1) – Residential and Tourism	4
2	ARC361	Interior Design with Light and Sound	3
3	ARC375	Furniture Design	3
4	ARC376	Interior Design Styles and Trends	2
5	ARC413	Interior Design (2) - Business, Corporate & Retail	4
6	ARC474	Interior Design Execution (2)	4
7	ARC475	Interior Specs & BOQs	2
		Subtotal	22

3B.6.2. IAE Elective Courses Lists / Concentrations *(20 CH)*

The student has to select 8 courses from the following lists: 4 courses of 3 CH each (A type) and 4 courses of 2 CH each (B type). If the student studies at least 12 CH from one of the lists, the relevant concentration title will be mentioned in his transcript.

Concentration 1: Architecture and Environment

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC363	Material Studies & Environmental Design	B	2	--
2	ARC463	Zero-Plus Energy Buildings	A	3	--
3	ARC364	Climate, Energy, & Architecture	B	2	--
4	ARC461	Environmental & Building Performance	A	3	--
5	ARC465	Environmental Architecture Design Techniques	A	3	--
6	ARC466	Special Topics in Environmental Design	B	2	--

Concentration 2: Furniture Design

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC311	Special Topics in Furniture Design	B	2	--
2	ARC321	Furniture Designers and Brands	B	2	--
3	ARC324	Furniture Mockups (Colors & Materials)	B	2	--
4	ARC431	Visualizing Furniture: Design & Drawings	A	3	--
5	ARC432	Digital Fabrication for Furniture Design	B	2	--
6	ARC441	Built-in Cabinet, Lighting & Styling	A	3	--
7	ARC471	Furniture Production and Technical Drawings	A	3	--

Concentration 3: Construction Technology

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC335	Virtual Augmented Reality & Artificial Intelligence	B	2	--
2	ARC342	Sustainable Technology	B	2	--
3	ARC433	BIM & 4D Simulation	A	3	--
4	ARC434	Innovative 3D printing Applications	A	3	--
5	ARC443	Prefabrication & Modular Construction	A	3	--
6	ARC444	Special Topics in Construction Technology	B	2	--

Concentration 4: Urban Design

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC323	Upgrading & Conservation	B	2	--
2	ARC325	Special Topics in Urban Design	B	2	--
3	ARC412	Visual Image Design	A	3	--
4	ARC424	Affordable Housing and Community Development	A	3	--
5	ARC426	Smart Cities and the Future of Transport Systems	B	2	--
6	ARC451	Landscape & Site Planning	A	3	--
7	ARC452	Detailed Neighborhood Design	B	2	--
8	ARC453	Designing Urban Spaces	A	3	--

Concentration 5: Sustainable Urban Mobility Planning

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC327	Special Topics in Sustainable Urban Mobility Planning	B	2	--
2	ARC426	Smart Cities and the Future of Transport Systems	B	2	--
3	ARC436	Geographic Information System (GIS)	A	3	--
4	ARC454	Sustainable Urban Mobility and Green Energy	B	2	--
5	ARC455	City Planning and Urban Mobility	A	3	--
6	ARC456	Transportation and Land Use Planning	A	3	--

Concentration 6: Landscape Architecture

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC328	Histories of Landscape Architecture	B	2	--
2	ARC357	Landscape Planting Design	B	2	--
3	ARC429	Healing Landscape	A	3	--
4	ARC445	Landscape Construction Design	A	3	--
5	ARC451	Landscape & Site Planning	A	3	--
6	ARC458	Special Topics in Landscape Architecture	B	2	--
7	ARC459	Reading the Contemporary Landscape	A	3	--

Concentration 7: Architecture with GIS

No.	Code	Course Title	Course Type	CH	Prereqst. Courses
1	ARC337	Introduction to Building Information Modeling (BIM) and Geographic Information Systems (GIS)	B	2	--
2	ARC338	Digital Twin Applications in Architecture and Urbanism using GIS and BIM [GeoBIM]	B	2	--
3	ARC439	Special topics in GIS & BIM	B	2	--
4	ARC481	Geospatial Analysis for Risk and Performance Management in Architecture	A	3	--
5	ARC482	Integrated Project Coordination and Site Management Using GIS & BIM [GeoBIM]	A	3	--
6	ARC483	GeoBIM for Sustainable Development Goals (SDGs): Asset and Facilities Management	A	3	--

3B.7. IAE Program Study Plan

Level 1 (Freshman)

First Semester

Common to All Engineering Students

#	Course Code	Course Title	Credits CH	Credits ECTS	Credits SWL	Weekly Contact Hours Lec.	Weekly Contact Hours Tut.	Weekly Contact Hours Lab.	Weekly Contact Hours TT	Prerequisite Course
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	--
2	EMP123	Physics I	**3**	5	125	2	2	1	5	--
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	--
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	--
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	--
6	ENG KET	English KET	**2**	3	75	2	0	0	2	--
7	PSC 110	Human Rights	**2**	3	75	2	0	0	2	--
		Total	**18**	30	750	13	9	3	25	

Second Semester

(Common to All Architectural Engineering Students)

#	Course Code	Course Title	Credits CH	Credits ECTS	Credits SWL	Weekly Contact Hours Lec	Weekly Contact Hours Tut	Weekly Contact Hours Lab	Weekly Contact Hours TT	Prerequisite Course
1	ARC121	History & Theories of Architecture (1)	**2**	3	75	2	0	0	2	--
2	ARC131	Graphics & Visual Skills	**2**	4	100	1	3	0	4	--
3	EED161	Computer Programming	**3**	5	125	2	0	2	4	--
4	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
5	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
6	EMP124	Physics II	**3**	5	125	2	2	1	5	--
7	MEC151	Production Technology	**2**	3	75	1	0	3	4	--
		Total	**18**	30	750	12	9	6	27	

Level 2 (Sophomore)

Third Semester

(Common to All Architectural Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC213	Architectural Design (1)	**4**	6	150	1	6	0	7	ARC121
2	ARC221	History & Theories of Architecture (2)	**2**	3	75	2	0	0	2	--
3	ARC243	Building Construction & Materials (1)	**3**	5	125	1	5	0	6	--
4	ARC281	Building' Laws & Regulations	**2**	4	100	1	2	0	3	--
5	SCM218	Steel Structure for Architects	**2**	4	100	1	2	0	3	--
6	ARC231	Computer-Aided Drafting	**2**	4	100	1	0	2	3	--
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	--
		Total	**17**	29	725	9	15	2	26	

Fourth Semester

(Common to All Architectural Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC214	Architectural Design (2)	**4**	6	150	1	6	0	7	ARC213
2	ARC244	Building Construction & Materials (2)	**3**	5	125	1	4	0	5	ARC243
3	ARC253	Landscape Architecture	**3**	5	125	2	3	0	5	--
4	ARC271	Building Information Modeling (BIM)	**2**	4	100	1	0	2	3	--
5	ENG PET	English PET	**2**	3	75	2	0	0	2	--
6	SCM219	Properties & Strength of Materials	**2**	4	100	1	2	0	3	--
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	--
		Total	**18**	30	750	10	15	2	27	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Contact Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Interior Architecture Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC315	Architectural Design (3)	**4**	6	150	1	6	0	7	ARC213 & ARC281
2	ARC322	History & Theories of Interior Design	**2**	3	75	1	2	0	3	--
3	ARC347	Building Construction & Materials (3)	**4**	6	150	1	6	0	7	ARC243
4	ARC361	Interior Design with Light and Sound	**3**	5	125	1	4	0	5	--
5	ARC362	Environmental Control, Acoustics, lighting systems and Technical Installations	**3**	5	125	1	4	0	5	--
6	SCM355	Reinforced Concrete & Foundations for Architects	**2**	4	100	1	2	0	3	--
		Total	**18**	29	725	6	24	0	30	

Sixth Semester

(Interior Architecture Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC312	Interior Design (1) – Residential &Tourism	**4**	6	150	1	5	0	6	ARC213
2	ARC332	Computer applications	**2**	3	75	1	0	2	3	EED161
3	ARC372	Interior Design Execution (1)	**3**	5	125	1	4	0	5	ARC243
4	ARC375	Furniture Design	**3**	5	125	1	4	0	5	--
5	ARC376	Interior Design Styles and Trends	**2**	4	100	1	2	0	3	--
6	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3B.6.2
7	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3B.6.2
		Total	**18**	31	775	7	19	2	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Contact Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Interior Architecture Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC413	Interior Design (2) -Business, Corporate & Retail	**4**	6	150	1	5	0	6	ARC213
2	ARC474	Interior Design Execution (2)	**4**	6	150	2	4	0	6	ARC243
3	ARC491	Graduation Project studies	**2**	4	100	1	2	0	3	successfully completing 116 CH
4	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3B.6.2
5	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3B.6.2
6	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3B.6.2
		Total	**18**	30	750	7	21	0	28	

Eighth Semester

(Interior Architecture Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	ARC475	Interior Specs & BOQs	**2**	4	100	1	2	0	3	ARC372 or ARC474
2	ARC492	Graduation Project	**5**	7	175	1	7	0	8	ARC491
3	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3B.6.2
4	ARCxXX	Program Elective (A)	**3**	5	125	1	4	0	5	See 3B.6.2
5	ARCxXX	Program Elective (B)	**2**	4	100	1	2	0	3	See 3B.6.2
6	FAC E1	Faculty Elective	**2**	3	75	2	0	0	2	--
7	UNV E3	University Elective 3	**2**	3	75	2	0	0	2	--
		Total	**19**	31	775	9	19	0	28	

3B.8. IAE Program Courses' Tree Diagram

All Engineering Students		Interior Architectural Engineering Students							
LEVEL 1		LEVEL 2			LEVEL 3			LEVEL 4	
1st Semester	2nd Semester	3rd Semester	4th Semester		5th Semester	6th Semester		7th Semester	8th Semester
18 CH	18 CH	17 CH	18 CH	0 CH	18 CH	18 CH	0 CH	18 CH	19 CH
Fall	Spring	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring
EMP113 Calculus I 3 CH	EMP114 Calculus II 3 CH	ARC213 Architectural Design (1) 4 CH	ARC214 Architectural Design (2) 4 CH		ARC315 Architectural Design (3) 4 CH	ARC312 Interior Design (1) – Residential &Tourism 4 CH		ARC413 Interior Design (2) - Business, Corporate & Retail 4 CH	ARC492 Graduation Project 5 CH
EMP123 Physics I 3 CH	EMP124 Physics II 3 CH	ARC243 Building Construction & Materials (1) 3 CH	ARC244 Building Construction & Materials (2) 3 CH		ARC347 Building Construction & Materials (3) 4 CH	ARC372 Interior Design Execution (1) 3 CH		ARC474 Interior Design Execution (2) 4 CH	Or ARC475 Interior Specs & BOQs 2 CH
EMP131 Engineering Mechanics 3 CH	EED161 Computer Programming 3 CH	ARC221 History & Theories of Architecture (2) 2 CH	ARC253 Landscape Architecture 3 CH	GEN211 Practical Training 1 0 CH (Prerequisite: Completion of 54CH)	ARC322 History & Theories of Interior Design 2 CH	ARC375 Furniture Design 3 CH	GEN311 Practical Training 2 0 CH (Prerequisite: Completion of 90CH)	ARC491 Graduation Project Studies 2 CH (Prerequisite:: successfully completing 116 CH)	ARCExXX Program Elective (A) 3 CH
EMP141 Engineering Drawing 2 CH	MEC151 Production Technology 2 CH	SCM218 Steel Structure fo Architects 2 CH	ARC271 Building Information Modeling 2 CH		ARC361 Interior Design with Light and Sound 3 CH	ARC332 Computer Application 2 CH		ARCExXX Program Elective (A) 3 CH	ARCExXX Program Elective (A) 3 CH
EMP151 General Chemistry 3 CH	EMP115 Probability & Statistics 3 CH	ARC281 Buildings' Laws & Regualtions 2 CH	SCM219 Properties & Strength of Materials 2 CH		ARC362 Environmental Control, Acoustics, lighting systems and Technical Installations 3 CH	ARCExXX Program Elective (B) 2 CH		ARCExXX Program Elective (A) 3 CH	ARCExXX Program Elective (B) 2 CH
ENG KET English KET 2 CH	ARC121 History & Theories of Architecture 1 2 CH	ARC231 Computer Aided Drafting 2 CH	ENG PET English PET 2 CH		SCM355 Rienforced Concrete & Foundtions for Architects 2 CH	ARCExXX Program Elective (B) 2 CH		ARCExXX Program Elective (B) 2 CH	FAC E1 Faculty Elective 2 CH
PSC 110 Human Rights 2 CH	ARC131 Graphics & Visual Skills 2 CH	UNV E1 University Elective 1 2 CH	UNV E2 University Elective 2 2 CH			ARC376 Interior Design Styles and Trends 2 CH			UNV E3 University Elective 3 2 CH
		University Requirements 12 CH	Faculty Requirements 30 CH		Department Requirement 61 CH	Sub-Specialty Requirement 41 CH			

3B.9. IAE Program Courses Mapped to Program Outcomes (Competencies)

Code	Course Title	(Level A - Engineering)										Level B Architecture engineering					Level C Interior Architecture engineering			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18	PO19
ARC121	History & Theories of Architecture (1)	■				■		■				■	■			■			■	
ARC131	Graphics & Visual Skills	■	■						■	■		■	■							
ARC213	Architectural Design (1)	■	■	■		■			■	■		■	■	■	■	■		■		
ARC214	Architectural Design (2)	■	■	■		■			■	■		■	■	■	■	■		■		
ARC221	History & Theories of Architecture (2)	■				■		■				■	■			■			■	
ARC231	Computer-Aided Drafting	■	■		■				■	■										
ARC243	Building Construction & Materials (1)	■	■	■	■	■							■	■	■		■			
ARC244	Building Construction & Materials (2)	■	■	■	■	■							■	■	■		■			
ARC253	Landscape Architecture		■			■	■	■	■	■	■	■	■			■				
ARC271	Building Information Modeling (BIM)	■	■		■		■								■					
ARC281	Building' Laws & Regulations	■	■	■	■						■		■	■	■	■				
ARC312	Interior Design (1) –Residential &Tourism		■			■	■	■	■	■							■	■	■	■
ARC315	Architectural Design (3)	■	■	■		■	■	■	■	■		■	■	■				■		
ARC322	History & Theories of Interior Design					■		■	■										■	■
ARC332	Computer Applications	■	■		■				■	■										
ARC347	Building Construction & Materials (3)	■	■	■										■	■					
ARC361	Interior Design with Light and Sound	■	■							■								■	■	■
ARC362	Environmental Control, Acoustics, lighting systems and Technical	■	■	■	■	■	■	■	■					■		■		■	■	
ARC372	Interior Design Execution (1)						■										■			■
ARC375	Furniture Design		■		■	■		■	■	■	■				■		■	■	■	■
ARC376	Interior Design Styles and Trends				■	■		■	■	■								■	■	
ARC413	Interior Design (2) -Business, Corporate & Retail		■			■	■	■	■	■							■	■	■	■
ARC474	Interior Design Execution (2)						■										■			■
ARC475	Interior Specs & BOQs	■	■	■		■	■				■			■	■	■	■			
ARC491	Graduation Project studies	■	■			■		■	■	■	■		■	■				■	■	
ARC492	Graduation Project	■	■	■			■	■	■	■	■	■	■	■	■		■	■	■	■
SCM218	Steel Structure for Architects	■	■	■			■					■	■	■	■					
SCM219	Properties & Strength of Materials	■	■	■			■					■	■	■	■					
SCM355	Reinforced Concrete & Foundations for Architects	■	■	■	■									■						

Section 4: Electrical Engineering Programs

4. ELECTRICAL ENGINEERING DEPARTMENT MAJOR PROGRAMS

4.0 Electrical Engineering Dept.

Course Coding

E	E	D		x	

Specialization

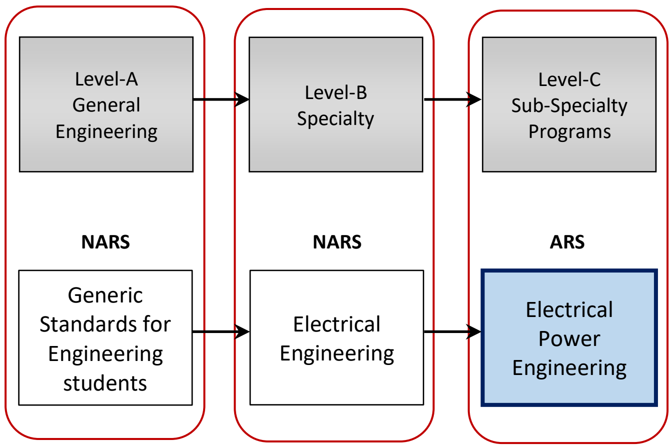
x	Specialization
1	Electrical Circuits and Electronics
2	Digital Systems
3	Signals and Communication Principles
4	Electrical Power systems
5	Electrical Machines, Power Electronics, and Control
6	Computer Engineering
7	Intelligent Systems
8	Communication Applications
9	Projects and Miscellaneous

4A. ELECTRICAL POWER ENGINEERING (EPE) PROGRAM

4A.1. EPE Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Electrical Engineering, and the Academic Reference Standard (**ARS**) for the "***Electrical Power Engineering***" program, developed by the Faculty.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)
AND ACADEMIC REFERENCE STANDARDS (**ARS**)



Different Levels of Competencies, as per NAQAAE

Also, the development of the program considers the conditions and constraints specified by the Accreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

4A.2. EPE Graduate Attributes

The graduate of the electrical power engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

4A.3. EPE Program Outcomes *(Levels A, B, and C)*

The Electrical Power Engineering graduate must be able to:

General Outcomes for EPE Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Specialization Outcomes for EPE Program (Level B - Electrical engineering)

PO11. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.

PO12. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.

PO13. Design and implement: elements, modules, sub-systems or systems in electrical/ electronic/ digital engineering using technological and professional tools.

PO14. Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.

PO15. Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

Sub-Specialization Outcomes for EPE Program (Level C – Electrical Power Engineering)

PO16. Use software packages pertaining to electrical power and energy conversion systems; identify the software appropriate for the purpose of simulation, analysis, design, and/or control of a specific application.

PO17. Investigate the defects and failures of components, systems, and processes based on appropriate fault diagnosis methodology, software tools and/or measuring instruments.

PO18. Integrate components and sub-systems to build up an assigned system with specific requirements considering compatibility constraints.

4A.4. EPE Program Graduation Requirements

EPE Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
EE Specialty Requirements *(sub-section 4A.5.)*	60	42%
EPE Sub-Specialty Requirements *(sub-section 4A.6.)*	42	29%
Total	144	100%

4A.5. Electrical Engineering Specialty Requirements *(60 CH)*

No.	Code	Course Title	CH
1	EED211	Electrical Circuits 1	3
2	EED212	Electrical Circuits 2	3
3	EED213	Electronics	3
4	EED222	Logic Design	3
5	EED223	Computer Organization	3
6	EED231	Signals and Systems	3
7	EED311	Electronic Circuits	4
8	EED314	Measurements and Instrumentation	3
9	EED323	Microprocessors and Microcontrollers	3
10	EED331	Electromagnetic Fields	3
11	EED344	Electrical Power Engineering	3
12	EED355	Control Systems	3
13	EED498	Graduation Project 1	2
14	EED499	Graduation Project 2	3
15	EMP213	Differential Equations	3
16	EMP214	Transformations and Complex Analysis	3
17	EMP216	Discrete Math and Numerical methods	3
18	EMP227	Solid State Physics	3
19	EED345	Electrical Power Transmission & Distribution	3
20	EED353	Transformers & Induction Machines	3
		Subtotal	60

4A.6. Electrical Power Engineering Sub-Specialty Requirements *(42 CH)*

4A.6.1 EPE Compulsory Courses List *(27 CH)*

No.	Code	Course Title	CH
1	EED346	High Voltage Engineering	3
2	EED351	Power Electronics 1	3
3	EED352	DC & Synchronous Machines	3
4	EED441	Renewable Energy	3
5	EED443	Power System Protection	3
6	EED446	Power System Analysis 1	3
7	EED447	Power System Analysis 2	3
8	EED451	Power Electronics 2	3
9	EED454	Electric Motor Drives	3
		Subtotal	27

4A.6.2. EPE Elective Courses Lists *(15 CH)*

Five courses (Technical Electives E1-E5) are to be selected from this list

No.	Code	Course Title	CH	Prerequisite Courses
1.	EED341	Power Quality	3	EED212
2.	EED354	Utilization of Electrical Energy	3	EED212
3.	EED347	Electrical Installations	3	EED212
4.	EED357	PLC & Applications	3	EED222
5.	EED356	Communication Systems	3	EED231
6.	EED342	Power System Operation & Control	3	EED344
7.	EED348	Smart Grids	3	EED344
8.	EED442	Power Distribution Systems	3	EED344
9.	EED445	Switchgear & Substations	3	EED344
10.	EED456	Energy Management	3	EED344
11.	EED444	Power System Planning	3	EED344
12.	EED452	Special Electrical Machines	3	EED353
13.	EED448	Advanced Power System Protection	3	EED443
14.	EED455	Advanced Power Electronics	3	EED451
15.	EED449	Selected Topics in Electrical Power Engineering	3	As advised

4A.7. EPE Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	9	3	25	

Second Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	6	6	25	

CH Credit Hours
ECTS European Credit Transfer System
SWL Student Workload / Semester

Lec Lecture hours / Week
Tut Tutorial hours / Week
Lab Laboratory hours / Week
TT Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED211	Electrical Circuits 1	**3**	5	125	2	2	1	5	EMP124
2	EED222	Logic Design	**3**	5	125	2	2	1	5	-
3	EMP213	Differential Equations	**3**	5	125	2	2	0	4	EMP114
4	EMP227	Solid State Physics	**3**	5	125	2	2	1	5	EMP124
5	FAC E1	Faculty Elective	**2**	4	100	2	0	0	2	-
6	PSC 110	Human Rights	**2**	3	75	2	0	0	2	-
7	UNV E3	University Elective 3	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	14	8	3	25	

Fourth Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED212	Electrical Circuits 2	**3**	5	125	2	2	1	5	EED211
2	EED213	Electronics	**3**	5	125	2	2	1	5	EMP227
3	EED223	Computer Organization	**3**	5	125	2	2	1	5	EED222
4	EED231	Signals & Systems	**3**	5	125	2	2	1	5	EMP213
5	EMP214	Transformations and Complex Analysis	**3**	5	125	2	2	0	4	EMP213
6	EMP216	Discrete Math and Numerical Methods	**3**	5	125	2	2	0	4	EMP213
		Total	**18**	30	750	12	12	4	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Training Hours (3 Weeks × 25 hrs/Week)	0	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Electrical Power Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED311	Electronic Circuits	**4**	6	150	3	2	1	6	EED213
2	EED323	Microprocessors and Microcontrollers	**3**	5	125	2	2	1	5	EED223
3	EED331	Electromagnetic Fields	**3**	5	125	2	2	0	4	EMP214
4	EED344	Electrical Power Engineering	**3**	5	125	2	2	0	4	EED212
5	EED352	DC & Synchronous Machines	**3**	5	125	2	2	1	5	EED212
6	EED355	Control Systems	**3**	5	125	2	2	0	4	EMP214
		Total	**19**	31	775	13	12	3	28	

Sixth Semester

(Electrical Power Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED E1	Technical Elective 1	**3**	5	125	2	2	0	4	See 4A.6.2.
2	EED314	Measurements & Instrumentation	**3**	5	125	2	1	2	5	EED213
3	EED345	Electrical Power Transmission & Distribution	**3**	5	125	2	2	0	4	EED212
4	EED346	High Voltage Engineering	**3**	5	125	2	2	0	4	EED212
5	EED351	Power Electronics 1	**3**	5	125	2	2	1	5	EED213
6	EED353	Transformers & Induction Machines	**3**	5	125	2	2	1	5	EED212
		Total	**18**	30	750	12	11	4	27	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Electrical Power Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED E2	Technical Elective 2	**3**	5	125	2	2	0	4	See 4A.6.2.
2	EED E3	Technical Elective 3	**3**	5	125	2	2	0	4	See 4A.6.2.
3	EED443	Power System Protection	**3**	5	125	2	2	1	5	EED344
4	EED446	Power System Analysis 1	**3**	5	125	2	2	0	4	EED344
5	EED451	Power Electronics 2	**3**	5	125	2	2	1	5	EED351
6	EED498	Graduation Project 1	**2**	4	100	1	0	3	4	Completion of 100 CH
		Total	**17**	29	725	11	10	5	26	

Eighth Semester

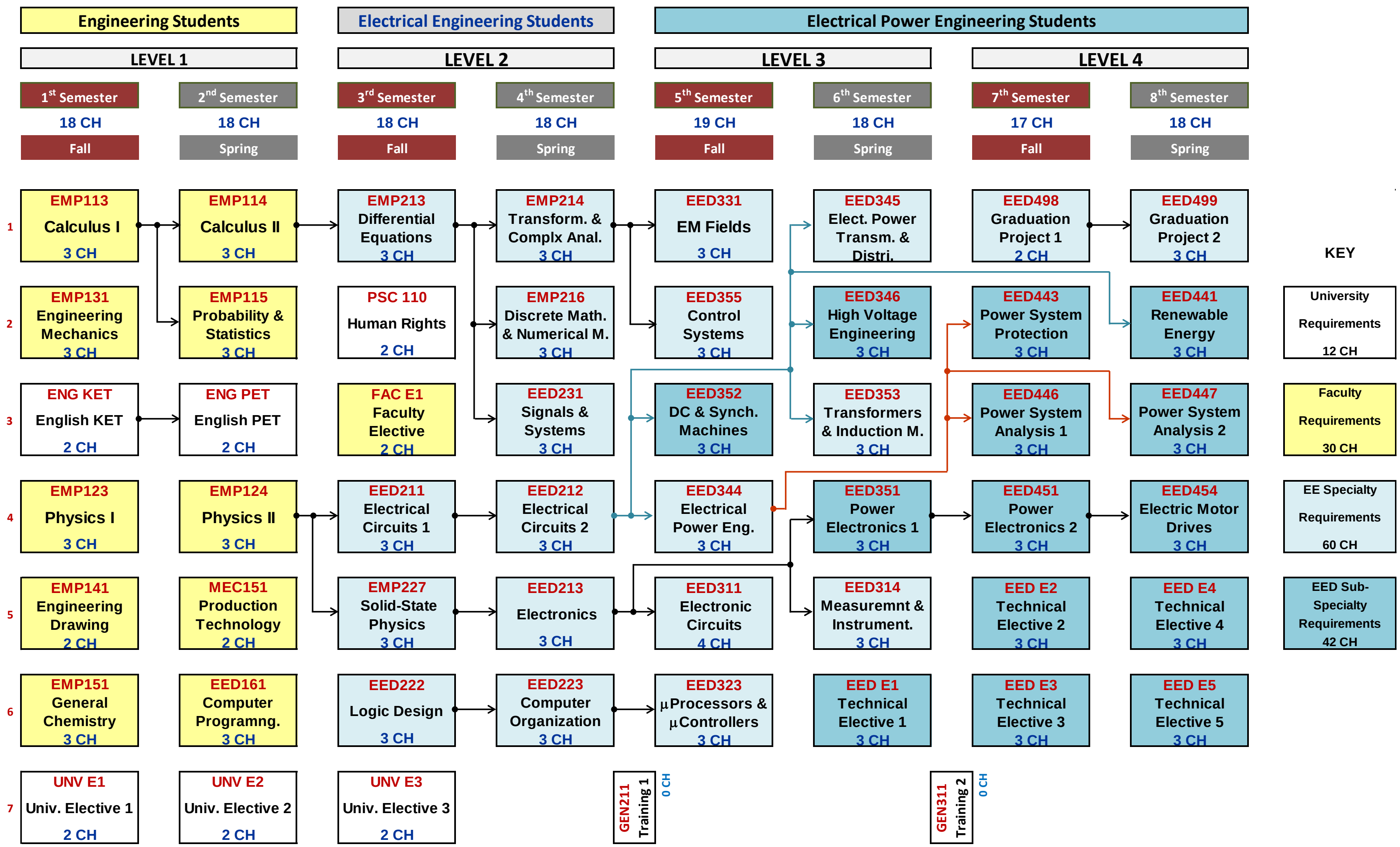
(Electrical Power Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED E4	Technical Elective 4	**3**	5	125	2	2	0	4	See 4A.6.2.
2	EED E5	Technical Elective 5	**3**	5	125	2	2	0	4	See 4A.6.2.
3	EED441	Renewable Energy	**3**	5	125	2	2	1	5	EED212
4	EED447	Power System Analysis 2	**3**	5	125	2	2	0	4	EED344
5	EED454	Electric Motor Drives	**3**	5	125	2	2	0	4	EED451
6	EED499	Graduation Project 2	**3**	5	125	1	0	6	7	EED498
		Total	**18**	30	750	11	10	7	28	

* *This number does not account for the contact hours during the 3 weeks following the final exams*

4A.8. EPE Program Courses' Tree Diagram

FUE - Faculty of Engineering & Technology - Electrical Power Eng. Program (144 CH) - Courses' Tree Diagram



4A.9. EPE Program Courses Mapped to Program Outcomes (Competencies)

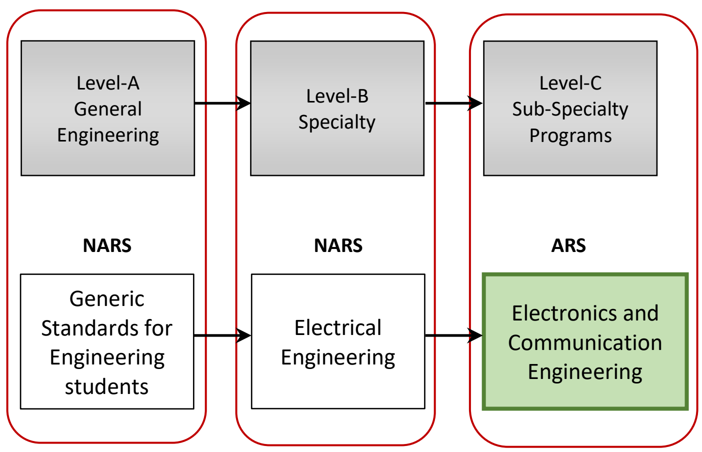
Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18
EED211	Electrical Circuits 1	■	■					■							■				
EED212	Electrical Circuits 2	■	■					■							■				
EED213	Electronics		■			■			■				■	■	■				
EED222	Logic Design	■	■										■						
EED223	Computer Organization		■	■									■	■					
EED231	Signals & Systems	■													■				
EED311	Electronic Circuits	■	■		■								■	■	■				
EED314	Measurements & Instrumentation		■		■									■	■				
EED323	Microprocessors & Microcontrollers		■	■	■					■	■		■			■			
EED331	Electromagnetic Fields	■										■							
EED344	Electrical Power Engineering	■					■	■	■			■				■			
EED355	Control Systems	■		■					■						■				
EED498	Graduation Project 1					■	■	■	■		■		■	■	■	■	■	■	■
EED499	Graduation Project 2					■	■	■	■	■			■	■	■	■	■	■	■
EMP213	Differential Equations	■										■	■						
EMP214	Transformations & Complex Analysis	■											■						
EMP216	Discrete Math and Numerical methods	■											■						
EMP227	Solid State Physics	■								■				■					
EED345	Electrical Power Transmission & Distributi	■					■					■			■		■		■
EED353	Transformers & Induction Machines	■	■					■				■			■				
EED346	High Voltage Engineering				■						■					■			
EED351	Power Electronics 1	■	■					■				■			■			■	
EED352	DC & Synchronous Machines	■	■					■				■			■				
EED441	Renewable Energy			■	■					■			■	■		■			
EED443	Power System Protection		■					■			■		■	■		■		■	■
EED446	Power System Analysis 1	■				■						■			■		■		
EED447	Power System Analysis 2	■				■						■			■				
EED451	Power Electronics 2		■					■	■	■		■		■	■		■		
EED454	Electric Motor Drives				■			■		■		■			■	■			■

4B. ELECTRONICS AND COMMUNICATION ENGINEERING (ECE) PROGRAM

4B.1. ECE Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Electrical Engineering program, and the Academic Reference Standard (**ARS**) for the "***Electronics and Communication Engineering***" program, developed by the Faculty.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)
AND ACADEMIC REFERENCE STANDARDS (**ARS**)



Different Levels of Competencies, as per NAQAAE.

Also, the development of the program considers the conditions and constraints specified by the Accreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

4B.2. ECE Graduate Attributes

The graduate of the electronics and communication engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

4B.3. ECE Program Outcomes *(Levels A, B, and C)*

The Electronics and Communication Engineering graduate must be able to:

General Outcomes for ECE Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Specialization Outcomes for ECE Program (Level B - Electrical engineering)

PO11. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.

PO12. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.

PO13 Design and implement: elements, modules, sub-systems or systems in electrical/ electronic/ digital engineering using technological and professional tools.

PO14. Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.

PO15. Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

Sub-Specialization Outcomes for ECE Program (Level C – Electronics and Communication Engineering)

PO16. Use software packages pertaining to electronics and/or communication subsystems or systems and select the appropriate software for the purpose of simulation, analysis, design, and/or control of a specific application.

PO17. Plan and manage engineering activities during the diverse implementation phases of the electronics/communication sub-systems and systems, and present relevant technical reports.

PO18. Investigate the defects and failures of components, modules, systems, and processes relevant to electronics and/or communication systems based on appropriate fault diagnosis methodology.

PO19. Integrate components, modules, and sub-systems to build up an assigned electronics and/or communication system with specific requirements considering compatibility constraints.

PO20. Design appropriate schemes for performing the necessary measurements of the main parameters of electronics and/or communication subsystems and systems, as well as interpret the measurements.

4B.4. ECE Program Graduation Requirements

ECE Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
EE Specialty Requirements *(section 4B.5.)*	60	42%
ECE Sub-Specialty Requirements *(sub-section 4B.6.)*	42	29%
Total	144	100%

4B.5. Electrical Engineering Specialty Requirements (*60 CH*)

No.	Code	Course Title	CH
1	EED211	Electrical Circuits 1	3
2	EED212	Electrical Circuits 2	3
3	EED213	Electronics	3
4	EED222	Logic Design	3
5	EED223	Computer Organization	3
6	EED231	Signals and Systems	3
7	EED311	Electronic Circuits	4
8	EED314	Measurements and Instrumentation	3
9	EED323	Microprocessors and Microcontrollers	3
10	EED331	Electromagnetic Fields	3
11	EED344	Electrical Power Engineering	3
12	EED355	Control Systems	3
13	EED498	Graduation Project 1	2
14	EED499	Graduation Project 2	3
15	EMP213	Differential Equations	3
16	EMP214	Transformations and Complex Analysis	3
17	EMP216	Discrete Math and Numerical methods	3
18	EMP227	Solid State Physics	3
19	EED312	Integrated Circuits Devices	3
20	EED332	Digital Signal Processing	3
		Subtotal	60

4B.6. Electronics and Communication Engineering Sub-Specialty Requirements (*42 CH*)

4B.6.1. ECE Compulsory Courses List *(27 CH)*

No.	Code	Course Title	CH
1	EED313	Digital Integrated-Circuits	3
2	EED333	Electromagnetic Waves	3
3	EED335	Analog Communication Systems	3
4	EED336	Digital Communication Systems	3
5	EED411	Electronic-Circuits for Communication	3
6	EED412	Analog Integrated Circuits	3
7	EED422	Real-time Embedded Systems	3
8	EED434	Microwave Engineering	3
9	EED435	Antenna and Propagation	3
		Subtotal	27

4B.6.2. ECE Elective Courses Lists *(15 CH)*

Group A *(6 CH)*

Two courses (Technical Electives A1, and A2) are to be selected from this list.

No.	Code	Course Title	CH	Prerequisite Courses
1	EED413	Microwave Devices	3	EED333
2	EED414	RF Circuits and Systems	3	EED311
3	EED415	VLSI Testing and Design for Testability	3	EED313
4	EED416	VLSI Design Automation	3	EED313
5	EED417	Optical Electronics	3	EMP227
6	EED425	Introduction to Robotics	3	EED223

Group B *(9 CH)*

Three courses (Technical Electives B1, B2, and B3) are to be selected from this list.

No.	Code	Course Title	CH	Prerequisite Courses
1	EED439	Introduction to Information Theory	3	EED336, EMP115
2	EED484	Wireless Communication	3	EED336
3	EED485	Satellite Communication	3	EED335
4	EED486	Optical Fiber Communication Systems	3	EED335
5	EED487	Modelling and Analysis of Telecommunication	3	EED336
6	EED489	Data Communication and Computer Networks	3	EED336
7	EED496	Selected Topics in Electronics Engineering	3	As advised
8	EED497	Selected Topics in Communication Engineering	3	As advised

4B.7. ECE Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	9	3	25	

Second Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	6	6	25	

CH	Credit Hours	Lec	Lecture hours / Week
ECTS	European Credit Transfer System	Tut	Tutorial hours / Week
SWL	Student Workload / Semester	Lab	Laboratory hours / Week
		TT	Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED211	Electrical Circuits 1	**3**	5	125	2	2	1	5	EMP124
2	EED222	Logic Design	**3**	5	125	2	2	1	5	-
3	EMP213	Differential Equations	**3**	5	125	2	2	0	4	EMP114
4	EMP227	Solid State Physics	**3**	5	125	2	2	1	5	EMP124
5	FAC E1	Faculty Elective	**2**	4	100	2	0	0	2	-
6	PSC 110	Human Rights	**2**	3	75	2	0	0	2	-
7	UNV E3	University Elective 3	**2**	3	75	2	0	0	2	-
		Total	18	30	750	14	8	3	25	

Fourth Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED212	Electrical Circuits 2	**3**	5	125	2	2	1	5	EED211
2	EED213	Electronics	**3**	5	125	2	2	1	5	EMP227
3	EED223	Computer Organization	**3**	5	125	2	2	1	5	EED222
4	EED231	Signals & Systems	**3**	5	125	2	2	1	5	EMP213
5	EMP214	Transformations and Complex Analysis	**3**	5	125	2	2	0	4	EMP213
6	EMP216	Discrete Math and Numerical Methods	**3**	5	125	2	2	0	4	EMP213
		Total	**18**	30	750	12	12	4	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Training Hours (3 Weeks × 25 hrs/Week)	0	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Electronics and Communication Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED311	Electronic Circuits	**4**	6	150	3	2	1	6	EED213
2	EED323	Microprocessors and Microcontrollers	**3**	5	125	2	2	1	5	EED223
3	EED331	Electromagnetic Fields	**3**	5	125	2	2	0	4	EMP214
4	EED335	Analog Communication Systems	**3**	5	125	2	2	1	5	EED231
5	EED344	Electrical Power Engineering	**3**	5	125	2	2	0	4	EED212
6	EED355	Control Systems	**3**	5	125	2	2	0	4	EMP214
		Total	**19**	31	775	13	12	3	28	

Sixth Semester

(Electronics and Communication Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED312	Integrated Circuits Devices	**3**	5	125	2	2	1	5	EMP227
2	EED313	Digital Integrated-Circuits	**3**	5	125	2	2	1	5	EED213
3	EED314	Measurements & Instrumentation	**3**	5	125	2	1	2	5	EED213
4	EED332	Digital Signal Processing	**3**	5	125	2	1	1	4	EED231
5	EED333	Electromagnetic Waves	**3**	5	125	2	2	0	4	EED331
6	EED336	Digital Communication Systems	**3**	5	125	2	2	1	5	EED335
		Total	**18**	30	750	12	10	6	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Training Hours (3 Weeks × 40 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Electronics and Communication Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED A1	Technical Elective A1	**3**	5	125	2	1	1	4	See 4B.6.2.
2	EED411	Electronic-Circuits for Communication	**3**	5	125	2	2	1	5	EED311
3	EED412	Analog Integrated Circuits	**3**	5	125	2	2	1	5	EED311
4	EED422	Real-time Embedded Systems	**3**	5	125	2	0	3	5	EED323
5	EED434	Microwave Engineering	**3**	5	125	2	2	1	5	EED333
6	EED498	Graduation Project 1	**2**	4	100	1	0	3	4	Completion of 100 CH
		Total	**17**	29	725	11	7	10	28	

Eighth Semester

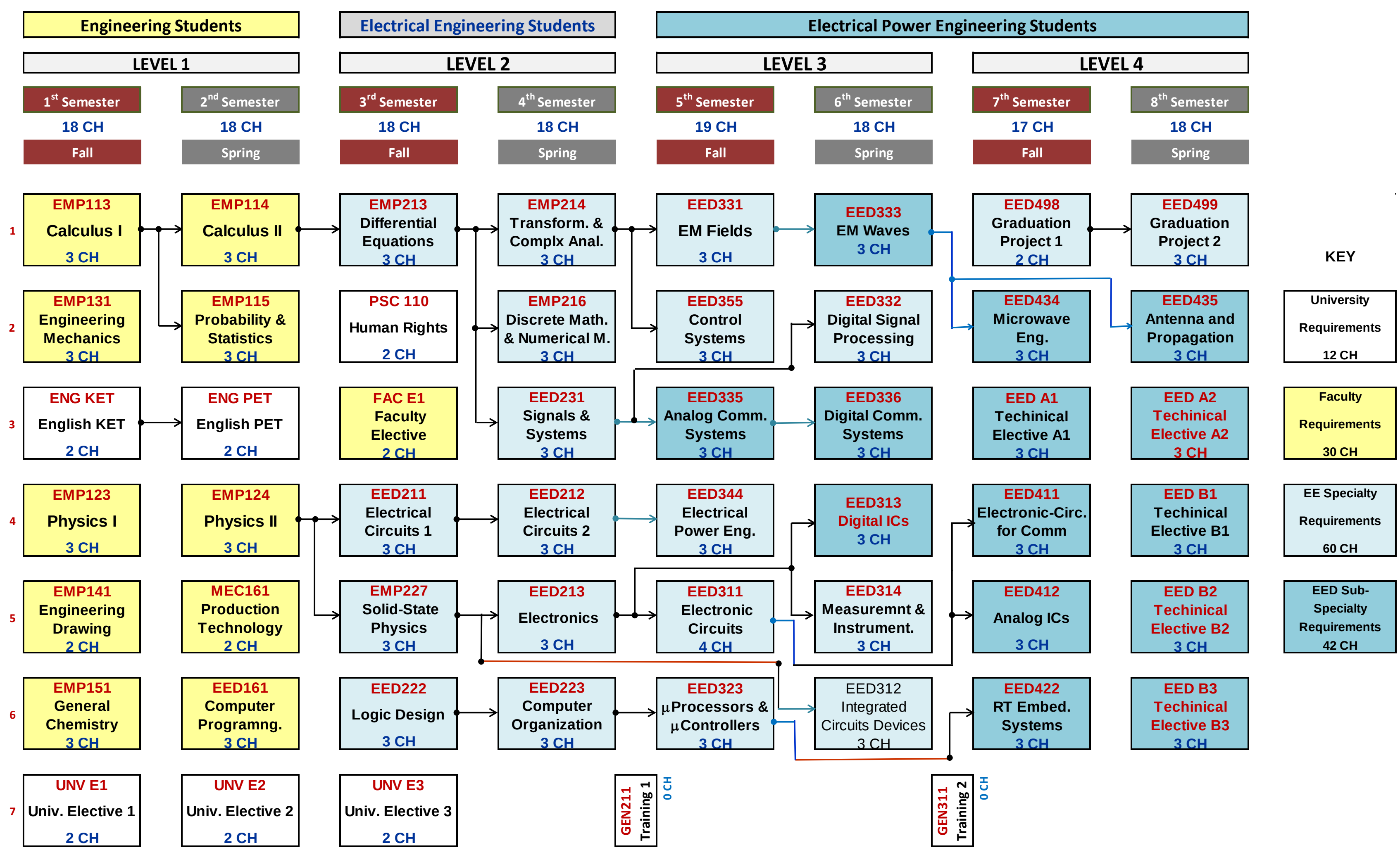
(Electronics and Communication Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED A2	Technical Elective A2	**3**	5	125	2	1	1	4	See 4B.6.2.
2	EED B1	Technical Elective B1	**3**	5	125	2	1	1	4	See 4B.6.2
3	EED B2	Technical Elective B2	**3**	5	125	2	1	1	4	See 4B.6.2
4	EED B3	Technical Elective B3	**3**	5	125	2	1	1	4	See 4B.6.2.
5	EED435	Antenna and Propagation	**3**	5	125	2	2	1	5	EED333
6	EED499	Graduation Project 2	**3**	5	125	1	0	6	7	EED498
		Total	**18**	30	750	11	6	11	28	

* *This number does not account for the contact hours during the 3 weeks following the final exams*

4B.8 ECE Program Courses' Tree Diagram (144 CH)

FUE - Faculty of Engineering & Technology - Electronics and Communication Eng. Program (144 CH) - Courses' Tree Diagram



4B.9 ECE Program Courses Mapped to Program Outcomes (Competencies)

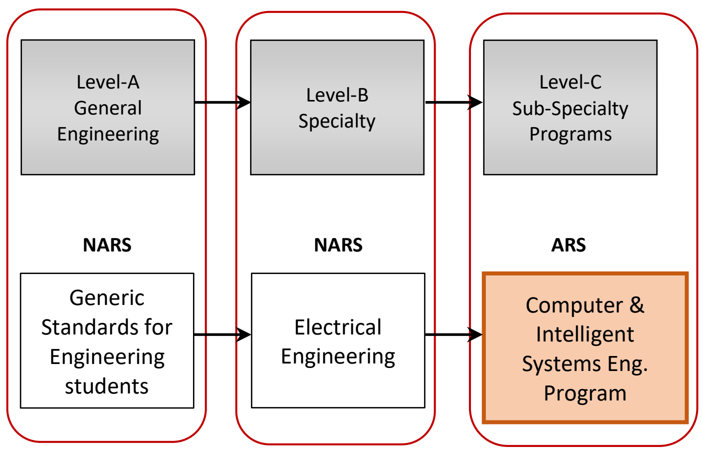
Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20
EED211	Electrical Circuits 1																				
EED212	Electrical Circuits 2																				
EED213	Electronics																				
EED222	Logic Design																				
EED223	Computer Organization																				
EED231	Signals & Systems																				
EED311	Electronic Circuits																				
EED314	Measurements & Instrumentation																				
EED323	Microprocessors & Microcontrollers																				
EED331	Electromagnetic Fields																				
EED344	Electrical Power Engineering																				
EED355	Control Systems																				
EED498	Graduation Project 1																				
EED499	Graduation Project 2																				
EMP213	Differential Equations																				
EMP214	Transformations & Complex Analysis																				
EMP216	Discrete Math and Numerical methods																				
EMP227	Solid State Physics																				
EED312	Integrated Circuits Devices																				
EED332	Digital Signal Processing																				
EED313	Digital Integrated-Circuits																				
EED333	Electromagnetic Waves																				
EED335	Analog Communication Systems																				
EED336	Digital Communication Systems																				
EED411	Electronic-Circuits for Communication																				
EED412	Analog Integrated Circuits																				
EED422	Real-time Embedded Systems																				
EED434	Microwave Engineering																				
EED435	Antenna and Propagation																				

4C. COMPUTER AND INTELLIGENT SYSTEMS ENGINEERING (CIS) PROGRAM

4C.1. CIS Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Electrical Engineering program. and the Academic Reference Standard (**ARS**) for the "***Computer and Intelligent Systems Engineering***" program, developed by the Faculty.

National Academic Reference Standards (**NARS**)
and Academic Reference Standards (**ARS**)



Different Levels of Competencies, as per NAQAAE.

Also, the development of the program considers the conditions and constraints specified by the Accreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

4C.2. CIS Graduate Attributes

The graduate of the computer and intelligent systems engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

4C.3. CIS Program Outcomes *(Levels A, B, and C)*

The Computer and Intelligent Systems Engineering graduate must be able to:

General Outcomes for CIS Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Specialization Outcomes for CIS Program (Level B - Electrical engineering)

PO11. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.

PO12. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.

PO13 Design and implement: elements, modules, sub-systems or systems in electrical/ electronic/ digital engineering using technological and professional tools.

PO14. Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation, and evaluate its suitability for a specific application.

PO15. Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

Sub-Specialization Outcomes for CIS Program (Level C – Computer and Intelligent Systems Eng.)

PO16. Use software packages pertaining to computer and/or intelligent systems and select the software appropriate for the purpose of simulation, analysis, design, and/or control of a specific application.

PO17. Plan and manage engineering activities during the diverse implementation phases of the computer/ intelligent sub-systems and systems, and present relevant technical reports.

PO18. Investigate the defects and failures of components, modules, systems, and processes relevant to computer and/or intelligent systems based on appropriate fault diagnosis methodology.

PO19. Integrate components and modules to build up an assigned computer and/or intelligent system with specific requirements considering compatibility constraints.

4C.4. CIS Program Graduation Requirements

CIS Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
EE Specialty Requirements *(section 4C.5.)*	60	42%
CIS Sub-Specialty Requirements *(sub-section 4C.6.)*	42	29%
Total	144	100%

4C.5. Electrical Engineering Specialty Requirements *(60 CH)*

No.	Code	Course Title	CH
1	EED211	Electrical Circuits 1	3
2	EED212	Electrical Circuits 2	3
3	EED213	Electronics	3
4	EED222	Logic Design	3
5	EED223	Computer Organization	3
6	EED231	Signals and Systems	3
7	EED311	Electronic Circuits	4
8	EED314	Measurements and Instrumentation	3
9	EED323	Microprocessors and Microcontrollers	3
10	EED331	Electromagnetic Fields	3
11	EED344	Electrical Power Engineering	3
12	EED355	Control Systems	3
13	EED498	Graduation Project 1	2
14	EED499	Graduation Project 2	3
15	EMP213	Differential Equations	3
16	EMP214	Transformations and Complex Analysis	3
17	EMP216	Discrete Math and Numerical methods	3
18	EMP227	Solid State Physics	3
19	EED261	Advanced Computer Programming	3
20	EED371	Artificial Intelligence	3
		Subtotal	60

4C.6. Computer & Intelligent Systems Eng. Sub-Specialty Requirements *(42 CH)*

4C.6.1. CIS Compulsory Courses List *(27 CH)*

No.	Code	Course Title	CH
1	EED337	Digital Image Processing	3
2	EED362	Data Structures and Algorithms	3
3	EED363	Operating Systems	3
4	EED364	Database Management Systems	3
5	EED372	Machine Learning	3
6	EED381	Data Communication	3
7	EED475	Fundamentals of Deep Learning	3
8	EED483	Introduction to Data Security	3
9	EED488	Computer Networks	3
		Subtotal	27

4C.6.2. CIS Elective Courses Lists *(15 CH)*

Five courses (Technical Electives E1-E5) are to be selected from this list

No.	Code	Course Title	CH	Prerequisite Courses
1	EED426	Real-time Embedded Systems	3	EED323
2	EED425	Introduction to Robotics	3	EED323
3	EED462	Software Engineering	3	EED362
4	EED461	Analysis and Design of Algorithms	3	EED362
5	EED463	Data Mining	3	EMP115
6	EED469	Fundamentals of Big Data Analysis	3	EMP115
7	EED465	Natural Language Processing	3	EED475
8	EED466	Cloud Computing	3	EED381
9	EED467	High Performance Computing	3	EED223, EED261
10	EED464	Selected Topics in Computer Engineering	3	As advised
11	EED473	Computer Vision	3	EED337
12	EED472	Reinforcement Learning	3	EED475
13	EED476	Autonomous Vehicles	3	EEDx71
14	EED478	Intelligent Games	3	EED371
15	EED477	Intelligent Control Systems	3	EED371
16	EED474	Computational Intelligence	3	EED371
17	EED479	Selected Topics in Intelligent Systems Engineering	3	As advised

4C.7. CIS Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	9	3	25	

Second Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	6	6	25	

CH	Credit Hours	Lec	Lecture hours / Week
ECTS	European Credit Transfer System	Tut	Tutorial hours / Week
SWL	Student Workload / Semester	Lab	Laboratory hours / Week
		TT	Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED211	Electrical Circuits 1	**3**	5	125	2	2	1	5	EMP124
2	EED222	Logic Design	**3**	5	125	2	2	1	5	-
3	EMP213	Differential Equations	**3**	5	125	2	2	0	4	EMP114
4	EMP227	Solid State Physics	**3**	5	125	2	2	1	5	EMP124
5	FAC E1	Faculty Elective	**2**	4	100	2	0	0	2	-
6	PSC 110	Human Rights	**2**	3	75	2	0	0	2	-
7	UNV E3	University Elective 3	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	14	8	3	25	

Fourth Semester

(Computer & Intelligent Systems Eng. Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED212	Electrical Circuits 2	**3**	5	125	2	2	1	5	EED211
2	EED213	Electronics	**3**	5	125	2	2	1	5	EMP227
3	EED223	Computer Organization	**3**	5	125	2	2	1	5	EED222
4	EED261	Advanced Computer Programming	**3**	5	125	2	0	3	5	EED161
5	EMP214	Transformations and Complex Analysis	**3**	5	125	2	2	0	4	EMP213
6	EMP216	Discrete Math and Numerical Methods	**3**	5	125	2	2	0	4	EMP213
		Total	**18**	30	750	12	10	6	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Computer & Intelligent Systems Eng. Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED231	Signals & Systems	**3**	5	125	2	2	1	5	EMP213
2	EED311	Electronic Circuits	**4**	6	150	3	2	1	6	EED213
3	EED323	Microprocessors and Microcontrollers	**3**	5	125	2	2	1	5	EED223
4	EED331	Electromagnetic Fields	**3**	5	125	2	2	0	4	EMP214
5	EED355	Control Systems	**3**	5	125	2	2	0	4	EMP214
6	EED371	Artificial Intelligence	**3**	5	125	2	1	1	4	EED261, EMP216
		Total	**19**	31	775	13	11	4	28	

Sixth Semester

(Computer & Intelligent Systems Eng. Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED314	Measurements & Instrumentation	**3**	5	125	2	1	2	5	EED213
2	EED337	Digital Image Processing	**3**	5	125	2	1	1	4	EED231
3	EED362	Data Structures and Algorithms	**3**	5	125	2	1	2	5	EED161
54	EED363	Operating Systems	**3**	5	125	2	1	1	4	EED223
5	EED372	Machine Learning	**3**	5	125	2	1	2	5	EMP115
6	EED381	Data Communication	**3**	5	125	2	1	2	5	EED231
		Total	**18**	30	750	12	6	10	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Computer & Intelligent Systems Eng. Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED E1	Technical Elective 1	**3**	5	125	2	1	1	4	See 4C.6.2.
2	EED E2	Technical Elective 2	**3**	5	125	2	1	1	4	See 4C.6.2.
3	EED364	Database Management Systems	**3**	5	125	2	2	1	5	EED362
4	EED475	Fundamentals of Deep Learning	**3**	5	125	2	2	1	5	EED372
5	EED488	Computer Networks	**3**	5	125	2	2	1	5	EED381
6	EED498	Graduation Project 1	**2**	4	100	1	0	3	4	Completion of 100 CH
		Total	**17**	29	725	11	8	8	27	

Eighth Semester

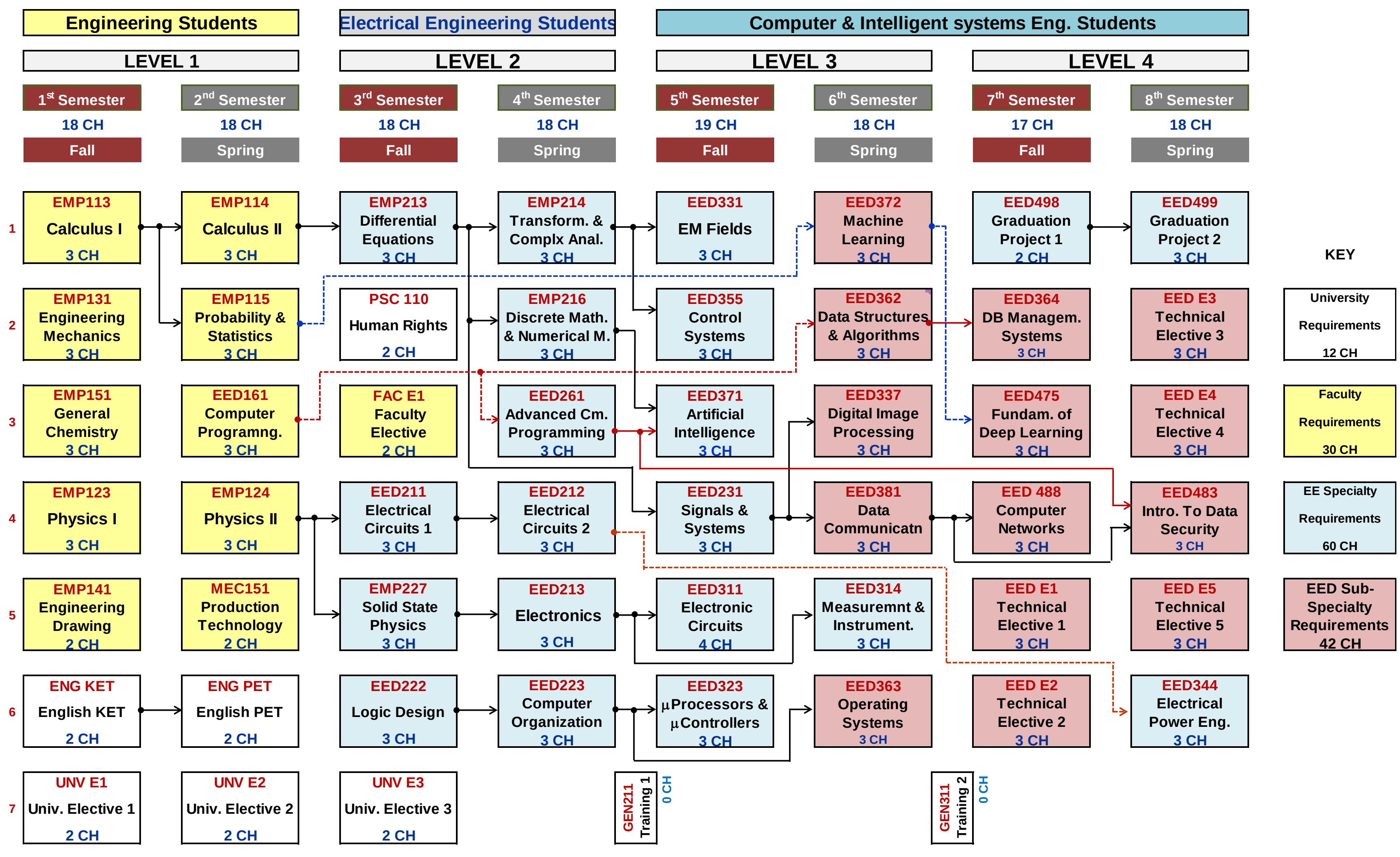
(Computer & Intelligent Systems Eng. Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED E3	Technical Elective 3	**3**	5	125	2	1	1	4	See 4C.6.2.
2	EED E4	Technical Elective 4	**3**	5	125	2	1	1	4	See 4C.6.2.
3	EED E5	Technical Elective 5	**3**	5	125	2	1	1	4	See 4C.6.2.
4	EED344	Electrical Power Engineering	**3**	5	125	2	2	0	4	EED212
5	EED483	Introduction to Data Security	**3**	5	125	2	2	1	5	EED261, EED381
6	EED499	Graduation Project 2	**3**	5	125	1	0	6	7*	EED498
		Total	**18**	30	750	11	7	10	28	

* *This number does not account for the contact hours during the 3 weeks following the final exams*

4C.8. CIS Program Courses' Tree Diagram

FUE - Faculty of Engineering & Technology - Computer & Intelligent systems Eng. Program (144 CH) - Courses' Tree Diagram



4C.9. CIS Program Courses Mapped to Program Outcomes (Competencies)

Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18	PO19
EED211	Electrical Circuits 1																			
EED212	Electrical Circuits 2																			
EED213	Electronics																			
EED222	Logic Design																			
EED223	Computer Organization																			
EED231	Signals & Systems																			
EED311	Electronic Circuits																			
EED314	Measurements & Instrumentation																			
EED323	Microprocessors & Microcontrollers																			
EED331	Electromagnetic Fields																			
EED344	Electrical Power Engineering																			
EED355	Control Systems																			
EED498	Graduation Project 1																			
EED499	Graduation Project 2																			
EMP213	Differential Equations																			
EMP214	Transformations & Complex Analysis																			
EMP216	Discrete Math and Numerical methods																			
EMP227	Solid State Physics																			
EED261	Advanced Computer Programming																			
EED371	Artificial Intelligence																			
EED337	Digital Image Processing																			
EED362	Data Structures and Algorithms																			
EED363	Operating Systems																			
EED364	Database Management Systems																			
EED372	Machine Learning																			
EED381	Data Communication																			
EED475	Fundamentals of Deep Learning																			
EED483	Introduction to Data Security																			
EED488	Computer Networks																			

Section 5: Mechanical Engineering Programs

5. MECHANICAL ENGINEERING DEPARTMENT MAJOR PROGRAMS

5.0 Mechanical Engineering Dept. Course Coding

M	**E**	**C**		**x**	

Specialization

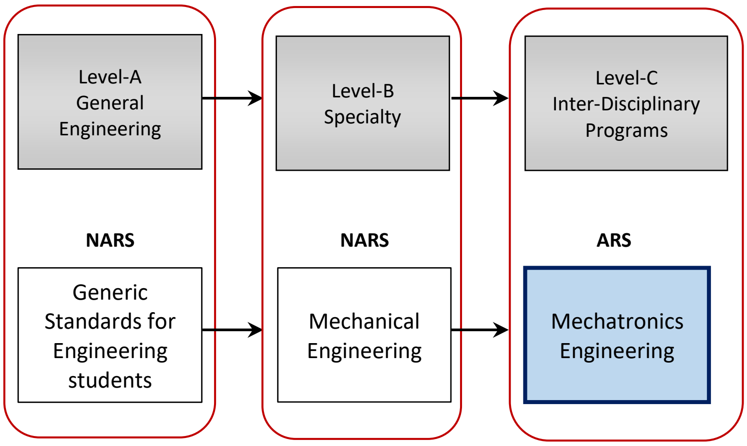
x	Specialization
1	Mechatronic Engineering
2	Control Engineering
3	Mechanical Power Engineering
4	Energy Engineering
5	Mechanical Design Engineering
6	Electrical and Electronic Engineering
7	Robotic and Industrial Engineering
9	Projects and Special Topics

5A. MECHATRONICS ENGINEERING (MEC) PROGRAM

5A.1. MEC Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Mechanical Engineering program, and the Academic Reference Standard (**ARS**) for the "***Mechatronics Engineering***" program, developed by the Faculty.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)
AND ACADEMIC REFERENCE STANDARDS (**ARS**)



Different Levels of Competencies, as per NAQAAE.

Also, the development of the program considers the conditions and constraints specified by the Accreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

5A.2. MEC Graduate Attributes

The graduate of the Mechatronics engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

5A.3. MEC Program Outcomes *(Levels A, B, and C)*

Graduates of the Mechatronics Program should be able to:

General Outcomes for MEC Program (Level A- Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

Specialization Outcomes for MEC Program (Level B - Mechanical engineering)

PO11. Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics, Solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis as well as Dynamics and Vibrations.

PO12. Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.

PO13. Select conventional mechanical equipment according to the required performance.

PO14. Adopt suitable national and international standards and codes; and integrate legal, economic and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems.

Sub-Specialization Outcomes for MEC Program (Level C- Mechatronics engineering)

PO15. Model, analyze and design an electrical/electronic/digital device(s) or component(s) as a subsystem of a whole Mechatronics system and identify the tools required to optimize this design.

PO16. Design and implement; elements, modules, sub-systems, or systems of Mechatronics Engineering considering the principals of electrical/electronic/digital engineering and using technological and professional tools.

PO17. Integrate synergistically, mechanical engineering design, electronics, and modern microprocessor-based control with the needed software to design, build, test, and operate a whole mechatronics system.

PO18. Adopt suitable national and international standards and codes and integrate legal, economic, and financial aspects to; design, build, operate, inspect and maintain mechatronics components and systems including Mechanical, Electrical, Electronics, Digital, microprocessor-based control units’ software and interfacing.

5A.4. MEC Program Graduation Requirements

Program Requirements	CH	%
University Requirements *(sub-section 2A.3)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
Mechanical Eng. Specialty Requirements *(sub-section 5A.5.)*	61	42%
MEC Sub-Specialty Requirements *(sub-section 5A.6.)*	41	29%
Total	144	100%

5A.5. Mechanical Engineering Specialty Requirements *(61 CH)*

No.	Code	Course Title	CH
1	EED359	Electrical Machines	3
2	EMP213	Differential Equations	3
3	EMP214	Transformations & Complex Analysis	3
4	EMP217	Linear Algebra & Geometry	3
5	EED218	Electrical circuits	3
6	EMP226	Materials Science	2
7	MEC211	Solid Mechanics	3
8	MEC231	Thermodynamics	3
9	MEC232	Fundamentals of Fluid Science	3
10	MEC252	Manufacturing Processes	3
11	MEC253	Mechanical Engineering Drawing	2
12	MEC261	Engineering Dynamics	2
13	MEC313	Sensors and Instrumentation	3
14	MEC322	Automatic Control	3
15	MEC331	System Dynamics and Modelling	3
16	MEC344	Fundamentals of Heat Transfer	3
17	MEC352	Mechanical Design 1	3
18	MEC353	Mechanical Design 2	3
19	MEC356	Theory of Machines	3
20	MEC461	Engineering Economics	2
21	MEC498	Graduation Project 1	2
22	MEC499	Graduation Project 2	3
Total			61

5A.6. Mechatronics Engineering Sub-Specialty Requirements *(41 CH)*

5A.6.1 MEC Compulsory Courses List *(26 CH)*

No.	Code	Course Title	CH
1	EED219	Electronics	3
2	EED329	Digital Systems	3
3	MEC312	Mechatronics System Design	3
4	MEC326	Programmable Logic Controllers (PLCs)	3
5	MEC421	Microprocessors and Embedded Systems	3
6	MEC423	Digital Control	3
7	MEC431	Fluid Power Control	3
8	MEC465	Power electronics and drive systems	2
9	MEC471	Robotics	3
		Total	26

5A.6.2. MEC Elective Courses Lists *(15 CH)*

The student must select the elective courses Elective 1, Elective 2, Elective 3, Elective 4, and Elective 5 from the list shown in the following table. These courses represent two tracks (Concentrations) *that give the student deeper knowledge in one of the subfields she/he may be interested in. If the student studies at least 9 hours from one of the lists, the relevant concentration will be mentioned in his transcript.*

Track	No.	Code	Course Title	CH	Prerequisite
Renewable Energy Engineering	1	MEC341	Hydrogen Generation and Application	3	MEC349
	2	MEC342	Solar Thermal Energy	3	MEC349
	3	MEC343	Wind Energy Systems	3	MEC349
	4	MEC349	Sustainable and Renewable Energy Sources	3	-
	5	MEC429	Vibration and Condition Monitoring	3	MEC331
	6	MEC441	Photovoltaic Systems	3	MEC349
	7	MEC442	Refrigeration and Air-Conditioning Technology	3	MEC231
	8	MEC443	Bioenergy Systems	3	MEC349
	9	MEC444	Hydraulic and Wave Energy	3	MEC349
	10	MEC445	Fuel Cell Technology	3	MEC349
	11	MEC446	Energy Conversion and Efficiency	3	MEC349
	12	MEC447	Nuclear Power Stations	3	-
	13	MEC448	Energy Environment Impact	3	-
Robotics and Automation Engineering	14	EED362	Data Structures and Algorithms	3	EED161
	15	MEC432	Intelligent Fault Diagnosis Systems	3	-
	16	MEC437	Artificial Intelligence for Robotics	3	-
	17	MEC438	Process Planning and Cost Estimation	3	-
	18	MEC439	Machine Learning	3	EMP115
	19	MEC472	Industrial Automation Technology (CAD/CAM)	3	MEC352
	20	MEC473	Reverse Engineering in Mechanical Engineering	3	-
	21	MEC474	Plant Engineering and Maintenance	3	MEC352
	22	MEC475	Industrial Robotics and Material Handling Systems	3	MEC437
	23	MEC476	Wireless Sensors Networks for Robotics	3	-
	24	MEC477	Computer Aided Design	3	MEC352
	25	MEC478	Autonomous systems	3	-
	26	MEC479	SCADA Systems	3	-
General	27	MEC494	Special Topics in Mechatronics-1	3	As advised
	28	MEC495	Special Topics in Mechatronics-2	3	As advised

5A.7. MEC Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	9	3	25	

Second Semester

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	6	6	25	

CH	Credit Hours	Lec	Lecture hours / Week
ECTS	European Credit Transfer System	Tut	Tutorial hours / Week
SWL	Student Workload / Semester	Lab	Laboratory hours / Week
		TT	Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(Common to All Mechanical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED218	Electrical circuits	3	5	125	2	2	0	4	EMP124
2	EMP213	Differential Equations	3	5	125	2	2	0	4	EMP114
3	EMP217	Linear Algebra & Geometry	3	5	125	2	2	0	4	-
4	EMP226	Materials Science	2	4	100	2	1	0	3	-
5	MEC211	Solid Mechanics	3	5	125	2	2	0	4	EMP131
6	MEC231	Thermodynamics	3	5	125	2	2	1	5	EMP123
		Total	**17**	**29**	**725**	**12**	**11**	**1**	**24**	

Fourth Semester

(Common to All Mechanical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	Course
1	EED219	Electronics	3	5	125	2	2	1	5	EMP124
2	EMP214	Transformations & Complex Analysis	3	5	125	2	2	0	4	EMP213
3	MEC232	Fundamentals of Fluid Science	3	5	125	2	2	1	5	EMP123
4	MEC252	Manufacturing Processes	3	5	125	2	2	0	4	MEC151
5	MEC253	Mechanical Engineering Drawing	2	4	100	1	0	3	4	EMP141
6	MEC261	Engineering Dynamics	2	3	75	1	3	0	4	EMP217
7	PSC 110	Human Rights	2	3	75	2	0	0	2	-
		Total	**18**	**30**	**750**	**12**	**11**	**5**	**28**	

Summer Training 1

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Contact Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Mechatronics Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED329	Digital Systems	3	5	125	2	2	1	5	-
2	EED359	Electrical Machines	3	5	125	2	2	0	4	EMP124
3	MEC313	Sensors and Instrumentation	3	5	125	2	2	1	5	EMP123
4	MEC331	System Dynamics and Modelling	3	5	125	2	2	1	5	EMP214
5	MEC352	Mechanical Design 1	3	5	125	2	3	0	5	MEC211 MEC253
6	MEC356	Theory of Machines	3	5	125	2	2	0	4	MEC261
		Total	**18**	**30**	**750**	**12**	**13**	**2**	**28**	

Sixth Semester

(Mechatronics Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	FAC E1	Faculty Elective 1	2	3	75	2	0	0	2	-
2	MEC312	Mechatronics System Design	3	5	125	2	2	1	5	MEC331
3	MEC322	Automatic Control	3	5	125	2	3	0	5	MEC331
4	MEC326	Programmable Logic Controllers (PLCs)	3	5	125	2	0	3	5	EED329
5	MEC344	Fundamentals of Heat Transfer	3	5	125	2	2	0	4	MEC232
6	MEC353	Mechanical Design 2	3	5	125	2	3	0	5	MEC352
7	UNV E3	University Elective 3	2	3	75	2	0	0	2	-
		Total	**19**	**31**	**775**	**14**	**10**	**4**	**28**	

Summer Training 2

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Contact Hours (3 Weeks ×25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Mechatronics Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	MEC E1	Elective 1	3	5	125	2	2	0	4	See 5A.6.2.
2	MEC E2	Elective 2	3	5	125	2	2	0	4	See 5A.6.2.
3	MEC421	Microprocessors and Embedded Systems	3	5	125	2	2	1	5	EED329
4	MEC461	Engineering Economics	2	3	75	2	0	0	2	-
5	MEC465	Power electronics and drive systems	2	4	100	1	2	0	3	EED219
6	MEC471	Robotics	3	5	125	2	2	0	4	MEC356
7	MEC498	Graduation Project 1	2	3	75	1	0	3	4	Approval
		Total	**18**	**30**	**750**	**12**	**10**	**4**	**26**	

Eighth Semester

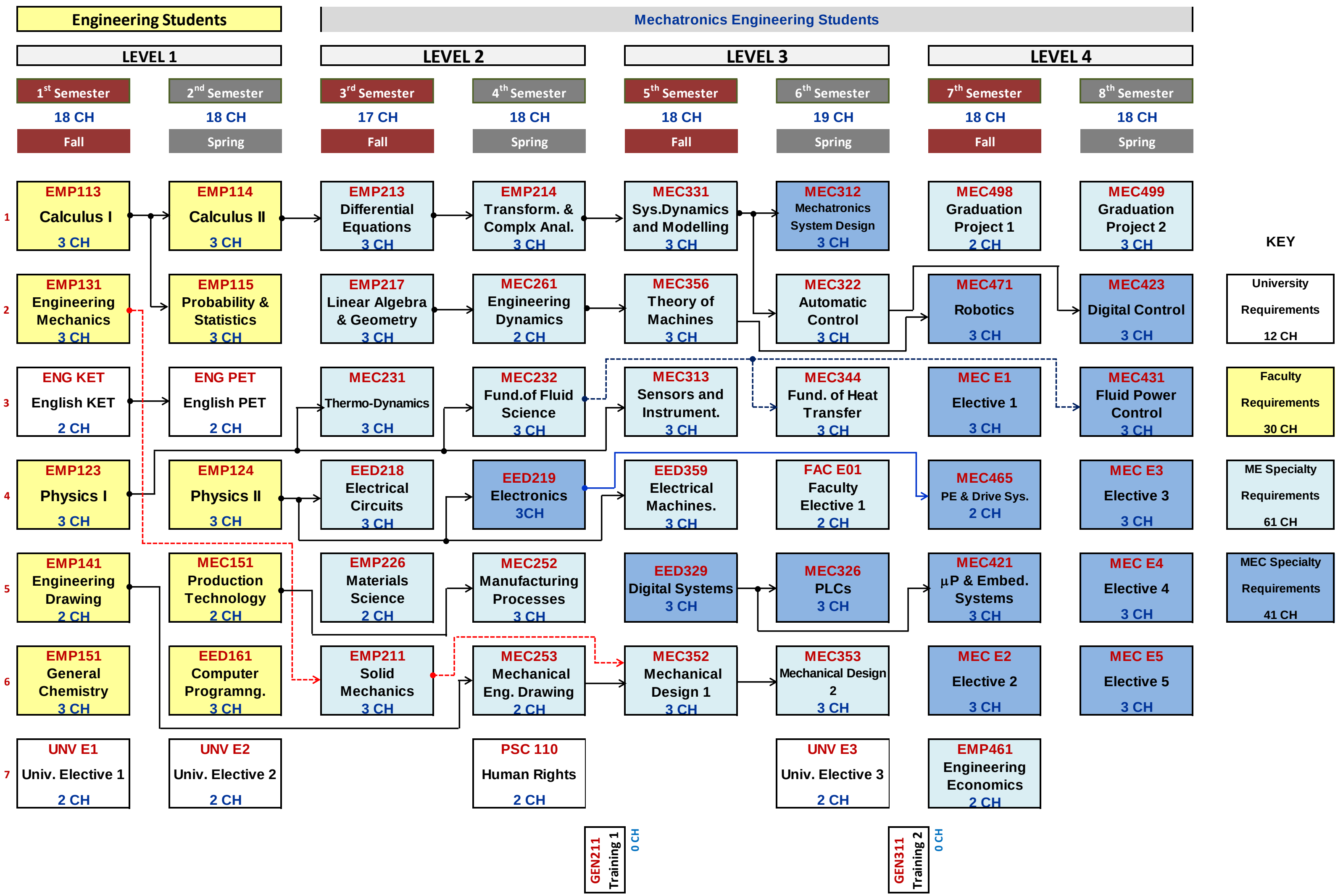
(Mechatronics Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Courses
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	MEC E3	Elective 3	3	5	125	2	2	0	4	See 5A.6.2.
2	MEC E4	Elective 4	3	5	125	2	2	0	4	See 5A.6.2.
3	MEC E5	Elective 5	3	5	125	2	2	0	4	See 5A.6.2.
4	MEC423	Digital Control	3	5	125	2	2	0	4	MEC322
5	MEC431	Fluid Power Control	3	5	125	2	2	1	5	MEC232
6	MEC499	Graduation Project 2	3	5	125	1	0	6	7*	MEC498
		Total	**18**	**30**	**750**	**11**	**10**	**7**	**28**	

**This number does not account for the contact hours during the four weeks following the final exams*

5A.8. Mechatronics Program Courses' Tree Diagram

FUE - Faculty of Engineering & Technology - Mechatronics Eng. Program (144 CH) - Courses' Tree Diagram



5A.9. Mechatronics Program Courses Mapped to Program Outcomes (Competencies)

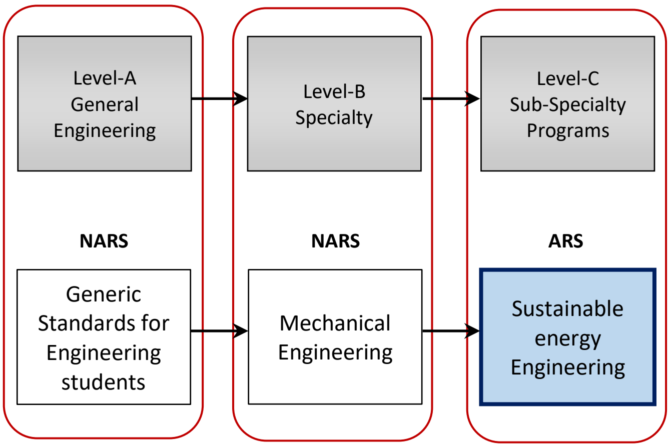
Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18
EED359	Electrical Machines	■										■		■					
EMP213	Differential Equations	■	■									■		■					
EMP214	Transformations & Complex Analysis		■								■			■		■			
EMP217	Linear Algebra & Geometry	■					■					■							
EED218	Electrical circuits							■					■			■			■
EMP226	Materials Science	■	■																
MEC211	Solid Mechanics	■	■		■														
MEC231	Thermodynamics	■	■	■															
MEC232	Fundamentals of Fluid Science	■	■						■			■							
MEC252	Manufacturing Processes	■											■		■			■	■
MEC253	Mechanical Engineering Drawing		■						■	■									
MEC261	Engineering Dynamics	■				■		■				■							
MEC313	Sensors and Instrumentation		■			■	■												
MEC322	Automatic Control			■			■		■		■								
MEC331	System Dynamics and Modelling	■							■			■		■					
MEC344	Fundamentals of Heat Transfer		■						■			■							
MEC352	Mechanical Design 1										■		■			■			■
MEC353	Mechanical Design 2			■											■		■		■
MEC356	Theory of Machines		■									■	■	■					
MEC461	Engineering Economics							■			■							■	
MEC498	Graduation Project 1				■	■	■	■	■	■	■				■	■	■	■	
MEC499	Graduation Project 2				■	■	■	■	■	■	■				■	■	■	■	
EED219	Electronics							■					■			■			■
EED329	Digital Systems							■			■					■	■		
MEC312	Mechatronics System Design									■			■		■		■		
MEC326	Programmable Logic Controllers (PLCs)				■						■		■			■			
MEC421	Microprocessors and Embedded Systems							■			■					■	■		
MEC423	Digital Control								■		■					■		■	
MEC431	Fluid Power Control				■			■						■				■	
MEC465	Power electronics and drive systems							■					■			■			■
MEC471	Robotics						■				■				■				■

5B. SUSTAINABLE ENERGY ENGINEERING (SEE) PROGRAM

5B.1. Sustainable Energy Engineering (SEE) Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Mechanical Engineering program, and the Academic Reference Standard (**ARS**) for the "***Sustainable energy Engineering***" program, developed by the faculty.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)
AND ACADEMIC REFERENCE STANDARDS (**ARS**)



Different Levels of Competencies, as per NAQAAE.

Also, the development of the program considers the conditions and constraints specified by the Accreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

5B.2. SEE Graduate Attributes

The graduate of the Sustainable energy Engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

5B.3. SEE Program Outcomes *(Levels A, B & C)*

The Sustainable Energy Engineering graduate must be able to:

General Outcomes for SEE Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

Specialization Outcomes for SEE Program (Level B - Mechanical engineering)

PO11. Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics, Solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis as well as Dynamics and Vibrations.

PO12. Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.

PO13. Select conventional mechanical equipment according to the required performance.

PO14. Adopt suitable national and international standards and codes; and integrate legal, economic and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems.

Sub-Specialization Outcomes for SEE Program (Level C – Sustainable energy Engineering)

PO15. Analyze, model, design and implement Sustainable energy engineering systems for effective utilization of conventional, new and renewable energy.

PO16. Analyze, model, design and implement Sustainable energy engineering systems to solve water crisis.

5B.4. SEE Program Graduation Requirements

Program Requirements	Credit Hours	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
Mechanical Eng. Specialty Requirements *(sub-section 5B.5.)*	61	42%
SEE Sub-Specialty Requirements *(sub-section 5B.6.)*	41	29%
Total	**144**	**100%**

5B.5. Mechanical Engineering Specialty Requirements *(61 CH)*

No.	Code	Course Title	CH
1	EED259	Electrical Machines	3
2	EMP213	Differential Equations	3
3	EMP214	Transformations & Complex Analysis	3
4	EMP217	Linear Algebra & Geometry	3
5	EMP226	Materials Science	2
6	MEC211	Solid Mechanics	3
7	MEC231	Thermodynamics	3
8	MEC232	Fundamentals of Fluid Science	3
9	MEC244	Applied Thermodynamics	3
10	MEC252	Manufacturing Processes	3
11	MEC253	Mechanical Engineering Drawing	2
12	MEC261	Engineering Dynamics	2
13	MEC313	Sensors and Instrumentation	3
14	MEC322	Automatic Control	3
15	MEC331	System Dynamics and Modelling	3
16	MEC344	Fundamentals of Heat Transfer	3
17	MEC352	Mechanical Design 1	3
18	MEC353	Mechanical Design 2	3
19	MEC356	Theory of Machines	3
20	MEC461	Engineering Economics	2
21	MEC498	Graduation Project 1	2
22	MEC499	Graduation Project 2	3
		Total	61

5B.6. Sustainable Energy Engineering Sub-Specialty Requirements *(41 CH)*

5B.6.1 SEE Compulsory Courses List *(26 CH)*

No.	Code	Course Title	CH
1	MEC334	Turbomachinery	3
2	MEC342	Solar Thermal Energy	3
3	MEC343	Wind Energy Systems	3
4	MEC349	Sustainable and Renewable Energy Sources	3
5	MEC425	Energy Storage Systems	3
6	MEC433	Water Desalination Systems	2
7	MEC435	Internal Combustion Engines	3
8	MEC436	Power Plant Technology	3
9	MEC441	Photovoltaic Systems	3
		Total	26

5B.6.2. SEE Elective Courses List *(15 CH)*

The student must select the elective courses Elective 1, Elective 2, Elective 3, Elective 4 and Elective 5 from the list shown in the following table. These courses represent two tracks (Concentrations) *that give the student deeper knowledge in one of the subfields she/he may be interested in. If the student studies at least 9 hours from one of the lists, the relevant concentration will be mentioned in his transcript.*

Track	No.	Code	Course Title	CH	Prerequisite
Renewable Energy Engineering	1	MEC341	Hydrogen Generation and Application	3	MEC349
	2	MEC429	Vibration and Condition Monitoring	3	MEC331
	3	MEC442	Refrigeration and Air-Conditioning Technology	3	MEC231
	4	MEC443	Bioenergy Systems	3	MEC349
	5	MEC444	Hydraulic and Wave Energy	3	MEC349
	6	MEC445	Fuel Cell Technology	3	MEC349
	7	MEC446	Energy Conversion and Efficiency	3	MEC349
	8	MEC447	Nuclear Power Stations	3	-
	9	MEC448	Energy Environment Impact	3	-
Robotics and Automation Engineering	10	EED362	Data Structure and Algorithms	3	EED161
	11	MEC432	Intelligent Fault Diagnosis Systems	3	
	12	MEC439	Machine Learning	3	EMP115
	13	MEC437	Artificial Intelligence for Robotics	3	-
	14	MEC438	Process Planning and Cost Estimation	3	-
	15	MEC472	Industrial Automation Technology (CAD/CAM)	3	MEC352
	16	MEC473	Reverse Engineering in Mechanical Engineering	3	-
	17	MEC474	Plant Engineering and Maintenance	3	MEC352
	18	MEC475	Industrial Robotics and Material Handling Systems	3	MEC437
	19	MEC476	Wireless Sensors Networks for Robotics	3	-
	20	MEC477	Computer Aided Design	3	MEC352
	21	MEC478	Autonomous systems	3	-
	22	MEC479	SCADA Systems	3	-
General	23	MEC496	Special Topics in Sustainable Energy-1	3	As advised
	24	MEC497	Special Topics in Sustainable Energy-2	3	As advised

5B.7. Sustainable Energy Engineering Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	**30**	**750**	**13**	**9**	**3**	**25**	

Second Semester

(Common to All Mechanical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	**30**	**750**	**13**	**6**	**6**	**25**	

CH	Credit Hours	Lec	Lecture hours / Week
ECTS	European Credit Transfer System	Tut	Tutorial hours / Week
SWL	Student Workload / Semester	Lab	Laboratory hours / Week
		TT	Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(Common to All Mechanical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED259	Electrical Machines	3	5	125	2	2	0	4	EMP124
2	EMP213	Differential Equations	3	5	125	2	2	0	4	EMP114
3	EMP217	Linear Algebra & Geometry	3	5	125	2	2	0	4	--
4	EMP226	Materials Science	2	4	100	2	1	0	3	--
5	MEC211	Solid Mechanics	3	5	125	2	2	0	4	EMP131
6	MEC231	Thermodynamics	3	5	125	2	2	1	5	EMP123
		Total	**17**	**29**	**725**	**12**	**11**	**1**	**24**	

Fourth Semester

(Common to All Mechanical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EMP214	Transformations & Complex Analysis	3	5	125	2	2	0	4	EMP213
2	MEC232	Fundamentals of Fluid Science	3	5	125	2	2	0	4	EMP123
3	MEC244	Applied Thermodynamics	3	5	125	2	2	0	4	MEC231
4	MEC252	Manufacturing Processes	3	5	125	2	2	0	4	MEC151
5	MEC253	Mechanical Engineering Drawing	2	4	100	1	0	3	4	EMP141
6	MEC261	Engineering Dynamics	2	3	75	1	3	0	4	EMP217
7	PSC 110	Human Rights	2	3	75	2	0	0	2	--
		Total	**18**	**30**	**750**	**12**	**11**	**3**	**26**	

Summer Training 1

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Mechanical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	Course
1	MEC313	Sensors and Instrumentation	3	5	125	2	2	0	4	EMP123
2	MEC331	System Dynamics and Modelling	3	5	125	2	3	0	5	EMP214
3	MEC344	Fundamentals of Heat Transfer	3	5	125	2	2	1	5	MEC232
4	MEC349	Sustainable and Renewable Energy Sources	3	5	125	2	3	0	5	MEC231
5	MEC352	Mechanical Design 1	3	5	125	2	3	0	5	MEC211 MEC253
6	MEC356	Theory of Machines	3	5	125	2	2	0	4	MEC261
		Total	**18**	**30**	**750**	**12**	**15**	**1**	**28**	

Sixth Semester

(Sustainable energy Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	Course
1	FAC E1	Faculty Elective 1	2	3	75	2	0	0	2	0
2	MEC322	Automatic Control	3	5	125	2	3	0	5	MEC331
3	MEC334	Turbomachinery	3	5	125	2	2	1	5	MEC232 MEC244
4	MEC342	Solar Thermal Energy	3	5	125	2	3	0	5	MEC349
5	MEC343	Wind Energy Systems	3	5	125	2	2	0	4	MEC349
6	MEC353	Mechanical Design 2	3	5	125	2	3	0	5	MEC352
7	UNV E3	University Elective 3	2	3	75	2	0	0	2	0
		Total	**19**	**31**	**775**	**14**	**13**	**1**	**28**	

Summer Training 2

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Sustainable energy Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	MEC E1	Elective 1	3	5	125	2	2	0	4	See 5B.6.2.
2	MEC E2	Elective 2	3	5	125	2	2	0	4	See 5B.6.2.
3	MEC433	Water Desalination Systems	2	3	75	1	2	0	3	MEC344
4	MEC435	Internal Combustion Engines	3	5	125	2	2	0	4	MEC244
5	MEC436	Power Plant Technology	3	5	125	2	2	0	4	MEC244
6	MEC461	Engineering Economics	2	3	75	2	0	0	2	--
7	MEC498	Graduation Project 1	2	4	100	1	0	3	4	Approval
		Total	**18**	30	750	12	10	3	25	

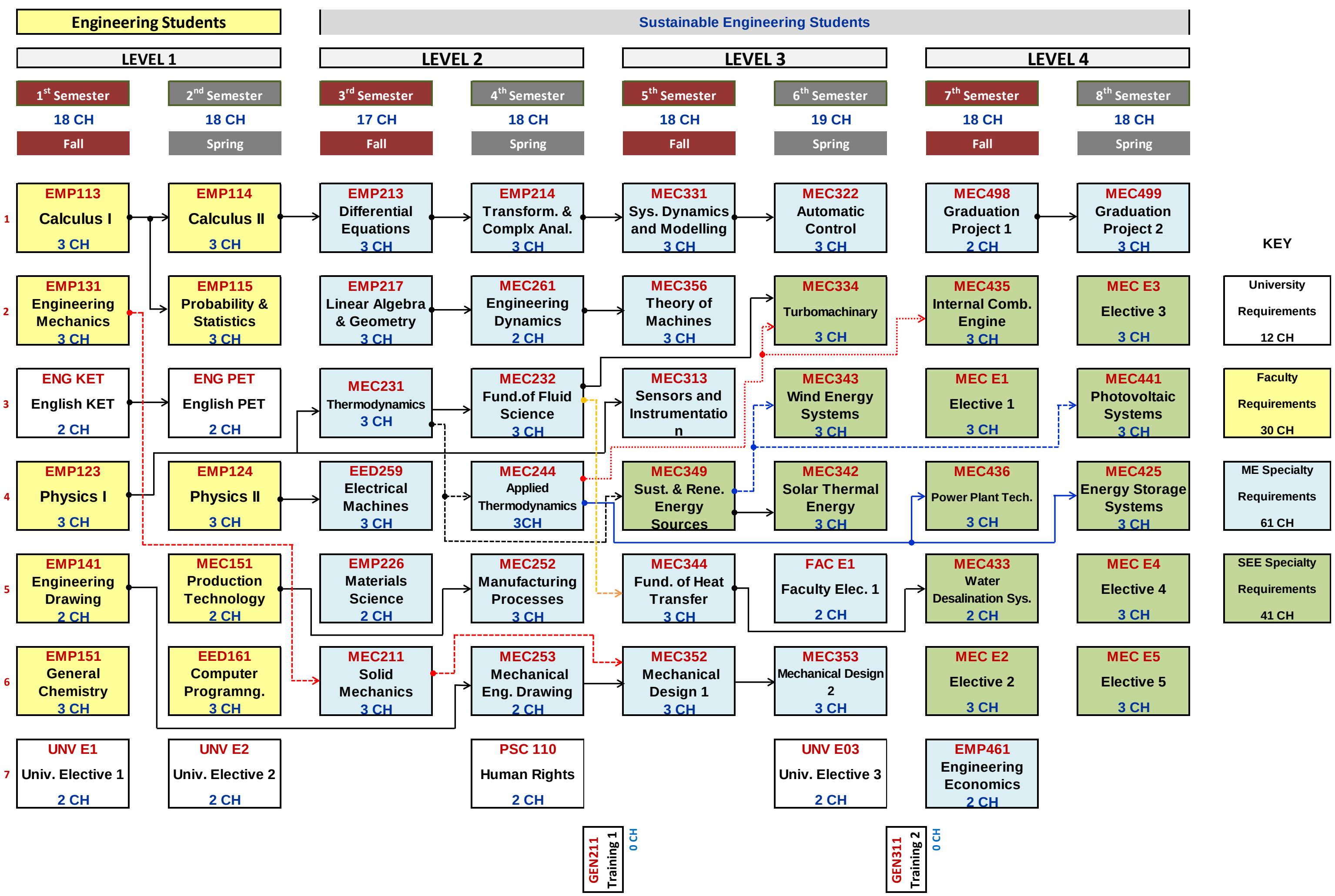
Eighth Semester

(Sustainable energy Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Courses
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	MEC E3	Elective 3	3	5	125	2	2	0	4	See 5B.6.2.
2	MEC E4	Elective 4	3	5	125	2	2	0	4	See 5B.6.2.
3	MEC E5	Elective 5	3	5	125	2	2	0	4	See 5B.6.2.
4	MEC425	Energy Storage Systems	3	5	125	2	2	0	4	MEC244
5	MEC441	Photovoltaic Systems	3	5	125	2	3	0	5	MEC349
6	MEC499	Graduation Project 2	3	5	125	1	0	6	7	MEC498
		Total	**18**	30	750	11	11	6	28	

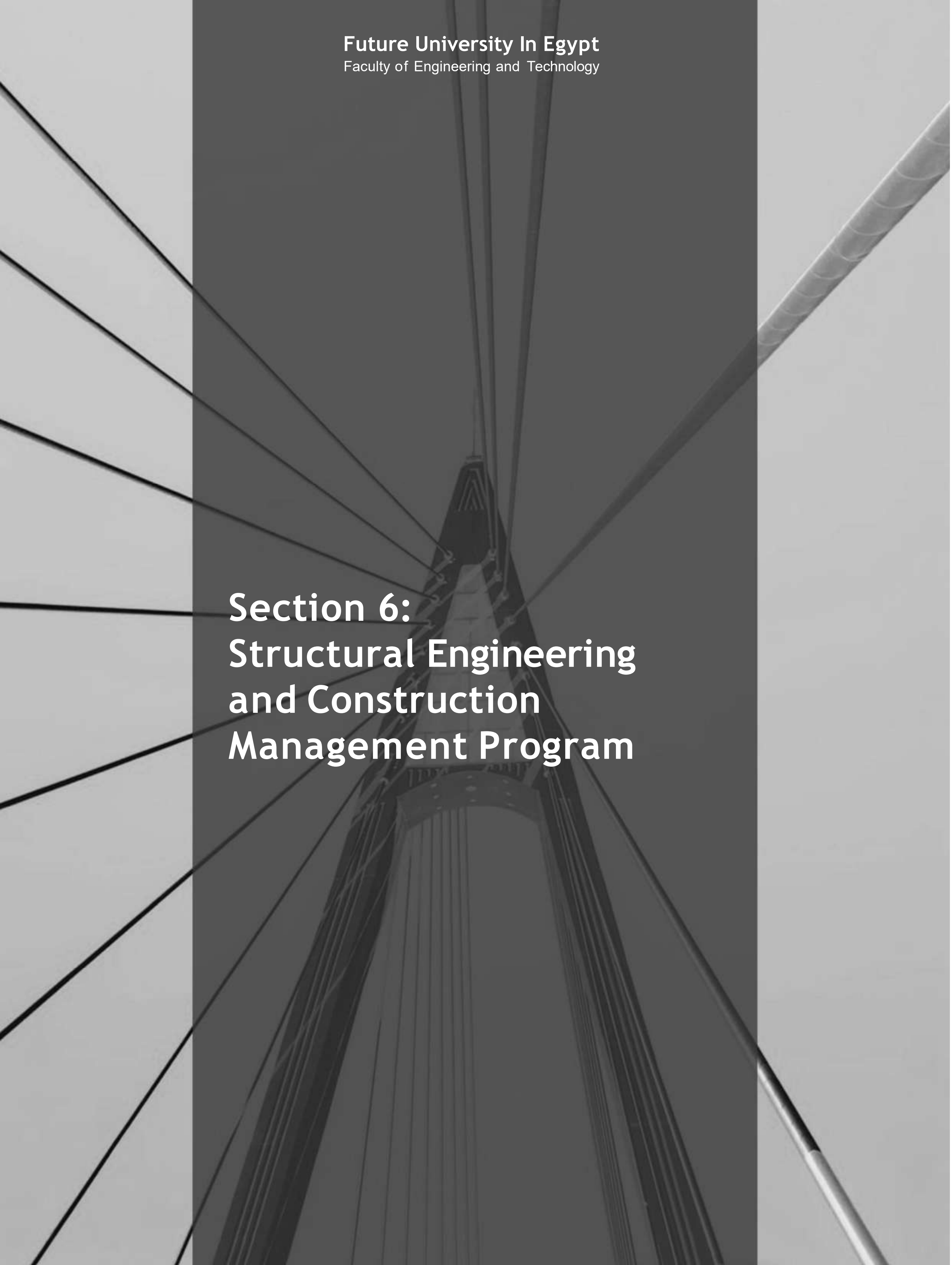
5B.8. SEE Program Courses' Tree Diagram

FUE - Faculty of Engineering & Technology - Sustainable Energy Eng. Program (144 CH) - Courses' Tree Diagram



5B.9. SEE Program Courses Mapped to Program Outcomes (Competencies)

Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18
EED259	Electrical Machines	■										■		■					
EMP213	Differential Equations	■	■									■		■					
EMP214	Transformations & Complex Analysis		■								■			■		■			
EMP217	Linear Algebra & Geometry	■					■					■							
EMP226	Materials Science	■	■																
MEC211	Solid Mechanics	■	■		■														
MEC231	Thermodynamics	■	■	■															
MEC232	Fundamentals of Fluid Science	■	■						■			■							
MEC244	Applied Thermodynamics											■			■	■			■
MEC252	Manufacturing Processes	■											■		■			■	■
MEC253	Mechanical Engineering Drawing		■						■	■									
MEC261	Engineering Dynamics	■				■		■				■							
MEC313	Sensors and Instrumentation		■			■	■												
MEC322	Automatic Control			■			■		■		■								
MEC331	System Dynamics and Modelling	■							■			■		■					
MEC344	Fundamentals of Heat Transfer		■						■			■							
MEC352	Mechanical Design 1										■		■			■			■
MEC353	Mechanical Design 2			■											■		■		■
MEC356	Theory of Machines		■									■	■	■					
MEC461	Engineering Economics							■			■							■	
MEC498	Graduation Project 1				■	■	■	■	■	■	■				■	■	■	■	
MEC499	Graduation Project 2				■	■	■	■	■	■	■				■	■	■	■	
MEC334	Turbomachinery											■		■	■				■
MEC342	Solar Thermal Energy			■		■							■				■		
MEC343	Wind Energy Systems				■								■			■	■		
MEC349	Sustainable and Renewable Energy Sources						■					■			■				
MEC425	Energy Storage Systems												■		■		■		
MEC433	Water Desalination Systems													■		■	■	■	
MEC435	Internal Combustion Engines												■	■	■			■	
MEC436	Power Plant Technology												■	■	■				■
MEC441	Photovoltaic Systems												■		■		■		■



Future University In Egypt
Faculty of Engineering and Technology

Section 6: Structural Engineering and Construction Management Program

6. STRUCTURAL ENGINEERING & CONSTRUCTION MANAGEMENT (SCM) DEPT. MAJOR PROGRAMS

6.0 Structural Engineering & Construction Management Dept.

Course Coding

S	**C**	**M**		**x**	

x → Specialization

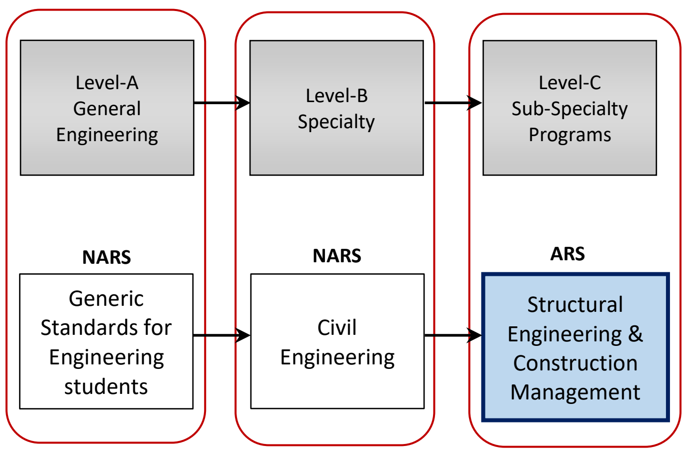
x	Specialization
1	Structure courses
2	Material courses
3	Survey, traffic and highway courses
4	Hydraulic, sanitary and irrigation courses
5	Reinforced concrete courses
6	Metallic structures courses
7	Geotechnical courses
8	Project management courses
9	Miscellaneous (Graphics, graduation project & advanced management courses)

6A. STRUCTURAL ENGINEERING & CONSTRUCTION MANAGEMENT (SCM) PROGRAM

6A.1. SCM Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for Civil Engineering programs besides additional specialized outcomes, and the Academic Reference Standard (**ARS**) for the "***Structural Engineering & Construction Management***" program, developed by the Faculty.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)
AND ACADEMIC REFERENCE STANDARDS (**ARS**)



Different Levels of Competencies, as per NAQAAE.

Also, the development of the program considers the conditions and constraints specified by the Accreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

6A.2. SCM Graduate Attributes

The graduate of structural engineering & construction management program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

6A.3. SCM Program Outcomes *(Levels A, B and C)*

The structural engineering & construction management graduate must be able to:

Outcomes for SCM Program (Level A – General Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Specialization Outcomes for SCM Program (Level B-Civil Engineering)

PO11. Select appropriate and sustainable technologies for construction of buildings, infrastructures and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics

PO12. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.

PO13. Plan and manage construction processes; address construction defects, instability and quality issues; maintain safety measures in construction and materials; and assess environmental impacts of projects

PO14. Deal with biddings, contracts and financial issues including project insurance and guarantees

Sub-Specialization Outcomes for SCM Program (Level C – Structural Eng. & Construction Management)

PO15. Use computer software, BIM concept and advanced techniques for modeling, analyzing, designing and managing construction projects

PO16. Deal with advanced construction management topics such as risk & resource management, value engineering, assets and facility management.

6A.4. SCM Program Graduation Requirements

SCM Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
Civil Eng. Specialty Requirements *(sub-section 6A.5)*	75	52%
SCM Sub-Specialty Requirements *(sub-section 6A.6)*	27	19%
Total	144	100%

6A.5. Civil Eng. Specialty Requirements *(75 CH)*

No.	Code	Course Title	CH	Prerequisite Courses
1	EMP213	Differential Equations	3	EMP114
2	EMP225	Waves and Vibrations	3	EMP123
3	EMP371	Geology	3	--
4	EMP411	Numerical Analysis	3	EMP114
5	MEC232	Fundamentals of Fluid Science	3	EMP123
6	SCM211	Structural Analysis 1	3	EMP131
7	SCM213	Structural Mechanics 1	3	SCM211
8	SCM221	Strength and Technology of Materials 1	3	--
9	SCM222	Strength and Technology of Materials 2	3	SCM221
10	SCM231	Planimetric Surveying	3	--
11	SCM282	Construction Project Management	4	--
12	SCM291	Civil Engineering Drawing	3	EMP141
13	SCM312	Structural Analysis 2	3	SCM211
14	SCM314	Structural Mechanics 2	3	SCM213
15	SCM341	Environmental & Sanitary Engineering	3	MEC232
16	SCM351	Fundamentals of Reinforced Concrete Design	3	SCM213
17	SCM352	Reinforced Concrete Slabs	3	SCM351

18	SCM361	Fundamentals of Metallic Structures Design	3	SCM213
19	SCM372	Soil Mechanics	3	EMP371
20	SCM382	Engineering Economics and Finance	3	--
21	SCM433	Transport Planning & Traffic Engineering	3	--
22	SCM434	Highway and Airport Engineering	3	SCM433
23	SCM473	Foundations	3	SCM372
24	SCM491	Graduation Project-1	2	As advised
25	SCM492	Graduation Project-2	3	As advised
		Subtotal	75	

6A.6. SCM Sub-Specialty Requirements *(27 CH)*

6A.6.1. Compulsory Courses List *(12 CH)*

No.	Code	Course Title	CH	Prerequisite Courses
1	SCM383	Construction Engineering Contracts	3	SCM282
2	SCM484	Introduction to BIM	3	SCM282
3	SCM485	Health, safety & risk Management in Construction	3	SCM282
4	SCM486	Quantity Surveying and Cost Estimation	3	--
		Subtotal	12	

6A.6.2. Elective Courses List *(15 CH)*

Five courses are to be selected from this list

No.	Code	Course Title	CH	Prerequisite Courses
1	ARC249	Building Construction	3	--
2	EED258	Electrical Installations & Construction Equipment	3	EMP124
3	SCM315	Structural Mechanics 3	3	SCM213
4	SCM316	Structural Mechanics 4	3	SCM213
5	SCM317	Structural Dynamics & Earthquake Engineering	3	SCM213
6	SCM418	Computer Applications for Structural Design	3	SCM352
7	SCM323	Advanced Technology of Construction Materials	3	SCM222
8	SCM324	Inspection and Repair of Structures	3	SCM222
9	SCM232	GIS and Photogrammetry	3	SCM231
10	SCM342	Hydraulics	3	MEC232
11	SCM343	Irrigation and Drainage Engineering.	3	MEC232
12	SCM453	Reinforced Concrete Tanks	3	SCM352
13	SCM454	High-Rise & Pre-Stressed Concrete Structures	3	SCM352
14	SCM462	Cold Formed & Composite Structures	3	SCM361
18	SCM463	Metallic Bridges	3	SCM361
19	SCM387	Resource Management	3	SCM282
20	SCM288	Construction Technology	3	--
21	SCM391	Value Engineering in Construction Projects	3	SCM282
22	SCM392	Computer Applications for Construction Management	3	SCM282
23	SCM393	AI in Construction Engineering	3	SCM282
24	SCM394	Assets Management	3	SCM282
25	SCM395	Facilities Management	3	SCM282

6A.7. SCM Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	9	3	25	

Second Semester

(SCM Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	6	6	25	

CH	Credit Hours	Lec	Lecture hours / Week
ECTS	European Credit Transfer System	Tut	Tutorial hours / Week
SWL	Student Workload / Semester	Lab	Laboratory hours / Week
		TT	Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(SCM Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EMP213	Differential Equations	**3**	5	125	2	2	0	4	EMP114
2	EMP225	Waves and Vibrations	**3**	5	125	2	1	1	4	EMP123
3	SCM211	Structural Analysis 1	**3**	5	125	2	2	0	4	EMP131
4	SCM221	Strength and Technology of Materials 1	**3**	5	125	2	1	1	4	--
5	SCM231	Planimetric Surveying	**3**	5	125	2	1	1	4	--
6	SCM291	Civil Engineering Drawing	**3**	5	125	2	2	0	4	EMP141
		Total	**18**	30	750	12	9	3	24	

Fourth Semester

(SCM Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	MEC232	Fundamentals of Fluid Science	3	5	125	2	2	1	5	EMP123
2	SCM213	Structural Mechanics 1	3	5	125	2	2	0	4	SCM211
3	SCM222	Strength and Technology of Materials 2	3	5	125	2	2	1	5	SCM221
4	SCM282	Construction Project Management	4	7	175	2	4	0	6	--
5	SCME01	Prog. Elective -1	3	5	125	2	2	0	4	See 6A.6.2.
6	PSC 110	Human Rights	2	3	75	2	0	0	2	--
		Total	**18**	30	750	12	12	2	26	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(SCM Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EMP371	Geology	3	5	125	2	2	1	5	--
2	SCM312	Structural Analysis 2	3	5	125	2	2	0	4	SCM211
3	SCM341	Environmental & Sanitary Engineering	3	5	125	2	2	0	4	MEC232
4	SCM351	Fund. of Reinforced Concrete Design	3	5	125	2	2	0	4	SCM213
5	SCM361	Fund. of Metallic Structures Design	3	5	125	2	2	0	4	SCM213
6	SCME02	Prog. Elective -2	3	5	125	2	2	0	4	See 6A.6.2.
		Total	**18**	30	750	12	12	1	25	

Sixth Semester

(SCM Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	SCM314	Structural Mechanics 2	3	5	125	2	2	0	4	SCM213
2	SCM352	Reinforced Concrete Slabs	3	5	125	2	2	0	4	SCM351
3	SCM372	Soil Mechanics	3	5	125	2	1	1	4	EMP371
4	SCM382	Engineering Economics and Finance	3	5	125	2	2	0	4	--
5	SCM383	Construction Engineering Contracts	3	5	125	2	2	0	4	SCM282
6	SCME03	Prog. Elective -3	3	5	125	2	2	0	4	See 6A.6.2.
		Total	**18**	30	750	12	11	1	24	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(SCM Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	FAC E01	Faculty Elective 1	2	3	75	2	0	0	2	--
2	SCM433	Transport Planning & Traffic Engineering	3	5	125	2	2	0	4	--
3	SCM473	Foundations	3	5	125	2	2	0	4	SCM372
4	SCM484	Introduction to BIM	3	5	125	2	1	1	4	SCM282
5	SCM491	Graduation Project-1	2	4	100	1	3	0	4	As advised
6	SCME04	Prog. Elective -4	3	5	125	2	2	0	4	See 6A.6.2.
7	UNV E3	University Elective 3	2	3	75	2	0	0	2	--
		Total	**18**	30	750	13	10	1	24	

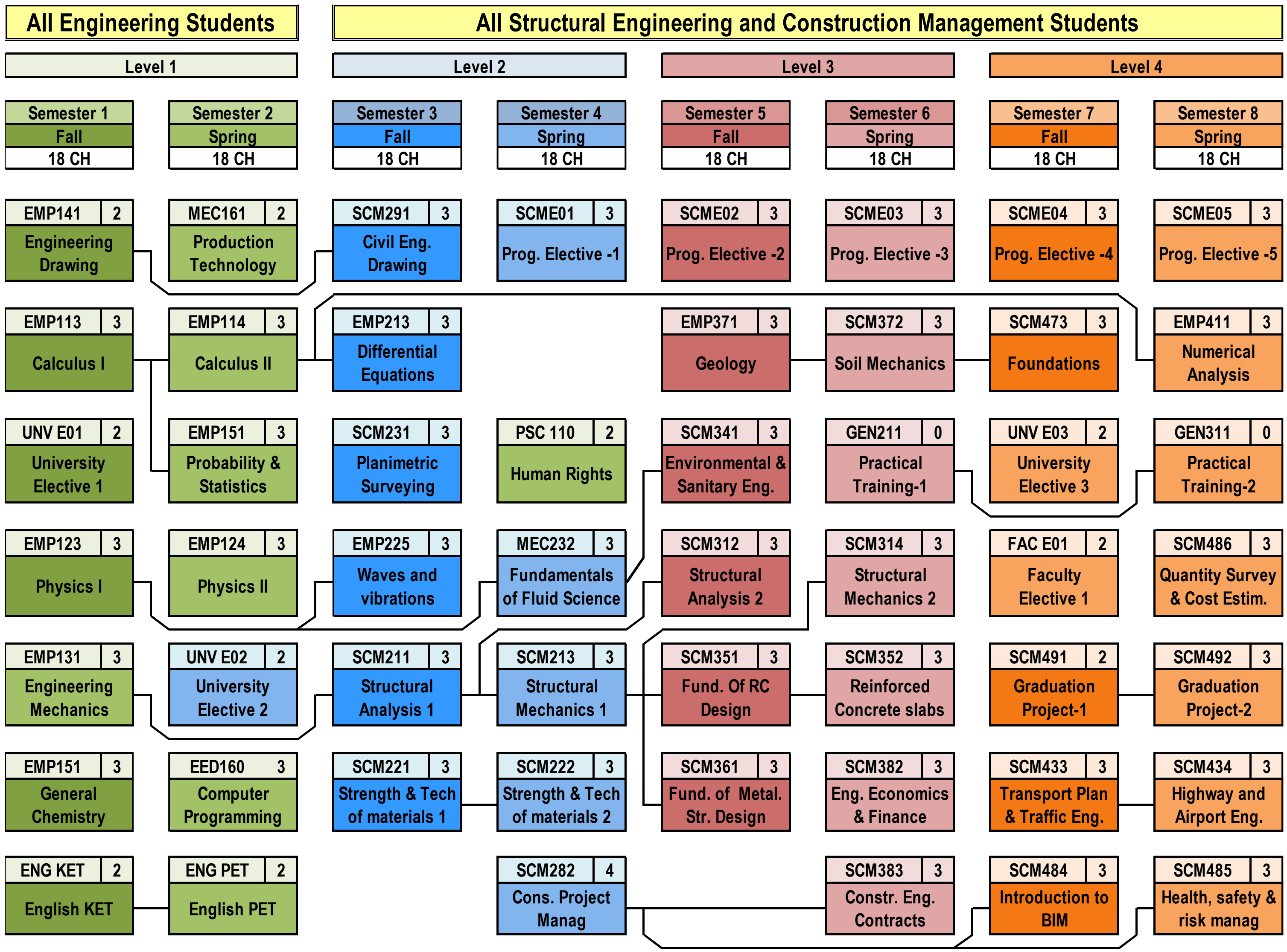
Eighth Semester

(SCM Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EMP411	Numerical Analysis	3	5	125	2	2	0	4	EMP114
2	SCM434	Highway and Airport Engineering	3	5	125	2	2	0	4	SCM433
3	SCM485	Health, Safety & Risk Management in Construction	3	5	125	2	2	0	4	SCM282
4	SCM486	Quantity Surveying and Cost Estimation	3	5	125	2	2	0	4	--
5	SCM492	Graduation Project-2	3	5	125	2	2	0	4*	SCM491
6	SCME05	Prog. Elective -5	3	5	125	2	2	0	4	See 6A.6.2.
		Total	**18**	30	750	12	12	0	24	

* *This number does not account for the contact hours during the 3 weeks following the final exams*

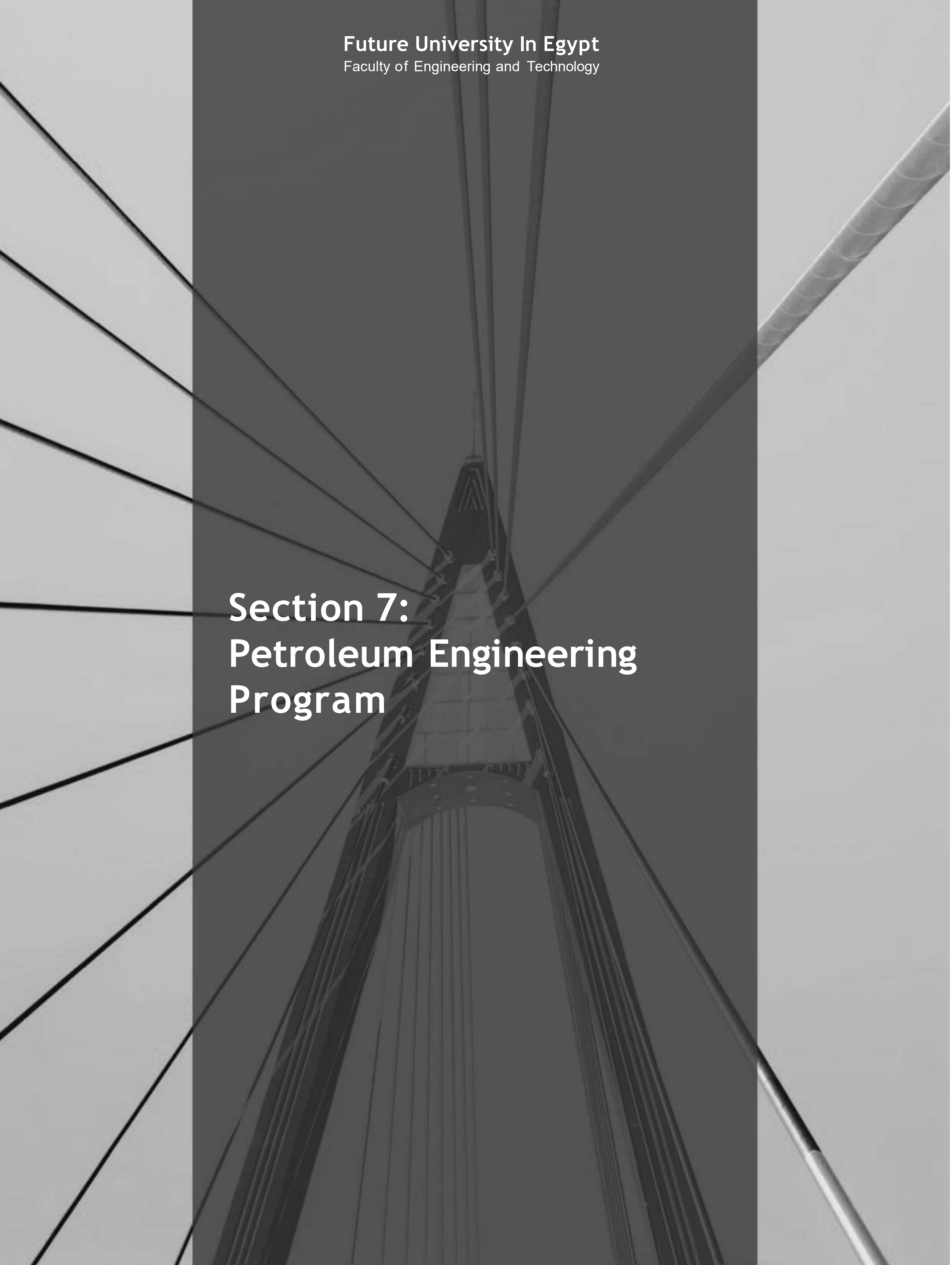
6A.8. SCM Program Courses' Tree Diagram



4A.9. SCM Program Courses Mapped to Program Outcomes (Competencies)

Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16
ARC249	Building Construction			1													
EED258	Electrical Installations& Construction Equipment		1									1					
EMP213	Differential Equations	1															
EMP225	Waves and vibrations	1															
EMP371	Geology		1									1					
EMP411	Numerical Analysis	1															
MEC232	Fundamentals of Fluid Science		1									1					
SCM211	Structural Analysis 1	1										1					
SCM213	Structural Mechanics 1	1										1					
SCM221	Strength and Technology of materials 1		1									1					
SCM222	Strength and Technology of Materials 2		1									1					
SCM231	Planimetric Surveying							1					1				
SCM282	Construction Project Management						1							1	1		
SCM291	Civil Engineering Drawing								1								
SCM312	Structural Analysis 2	1										1					
SCM314	Structural Mechanics 2	1										1					
SCM341	Environmental & Sanitary Engineering			1									1				
SCM351	Fundamentals of Reinforced Concrete Design				1								1				
SCM352	Reinforced Concrete Slabs				1								1				
SCM361	Fundamentals of Metallic Structures Design				1								1				
SCM372	Soil Mechanics		1									1					
SCM382	Engineering Economics and Finance					1									1		
SCM383	Construction Engineering Contracts						1								1		
SCM433	Transport Planning & Traffic Engineering			1									1				
SCM434	Highway and Airport Engineering			1									1				
SCM473	Foundations			1	1								1				
SCM484	Introduction to BIM						1		1	1						1	
SCM485	Health, safety & risk management in construction						1							1			1
SCM486	Quantity Surveying and Cost Estimation													1		1	
SCM491	Graduation Project-1			1	1	1	1	1	1	1	1	1	1	1	1	1	1
SCM492	Graduation Project-2			1	1	1	1	1	1	1	1	1	1	1	1	1	1
SCM315	Structural Mechanics 3	1										1					

Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16
SCM316	Structural Mechanics 4	1										1					
SCM317	Structural Dynamics & Earthquake Engineering	1			1							1					
SCM418	Computer applications for structural design	1							1	1	1		1				
SCM323	Advanced Technology of Construction Materials				1							1					
SCM324	Inspection and Repair of Structures		1										1				
SCM232	GIS and photogrammetry				1								1				
SCM324	Hydraulics		1									1					
SCM343	Irrigation and Drainage Engineering.			1									1				
SCM453	Reinforced concrete tanks				1								1				
SCM454	High-rise & pre-stressed concrete structures				1								1				
SCM462	Cold formed & composite Structures				1								1				
SCM463	Metallic Bridges				1								1				
SCM387	Resource Management						1										1
SCM288	Construction Technology			1										1			
SCM391	Value Engineering in Construction Projects						1										1
SCM392	Computer applications for construction manag.				1				1	1	1					1	
SCM393	AI in construction engineering						1		1	1						1	
SCM394	Assets management						1										1
SCM395	Facilities management						1										1



Section 7:
Petroleum Engineering Program

7. PETROLEUM ENGINEERING DEPARTMENT MAJOR PROGRAMS

7.0 Petroleum Engineering Dept. Course Coding

P	**E**	**T**		**x**	

Specialization

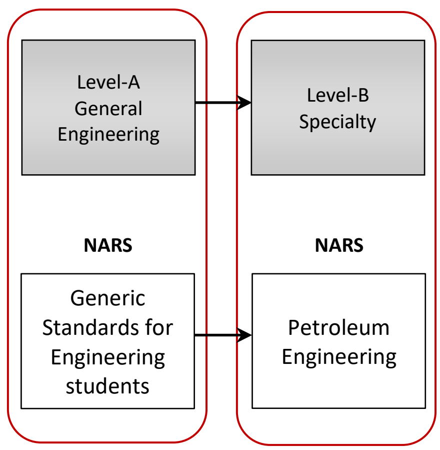
x	Specialization
1	Drilling Engineering
2	Production Engineering
3	Reservoir Engineering
4	Geology
5	Petrochemicals, Refining, Natural Gas Eng. And Processing
6	Economics
7	Environmental/Health/Safety, Energy Resources, Sustainability
9	Graduation Projects

7A. PETROLEUM ENGINEERING (PET) PROGRAM

7A.1. PET Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along with the relevant NARS for the Petroleum Engineering program.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)



Also, the development of the program considers the conditions and constraints specified by the Accreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

7A.2. PET Graduate Attributes

The program aims to provide future engineers with appropriate theoretical knowledge and technical skills to respond to professional market demands. The graduate of the petroleum engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

7A.3. PET Program Outcomes *(Levels A, and B)*

The petroleum engineering graduate must be able to:

General Outcomes for PET Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

Specialization Outcomes for PET Program (Level B – Petroleum Engineering)

PO11. Analyze geological data, interpret well-logs, estimate hydrocarbon reserves and evaluate reservoir performance by applying the principles and basic concepts of: geology, geophysics and reservoir engineering.

PO12. Plan and construct oil wells, develop oilfield production programs, design early surface facilities plants and field evacuation plans by applying the principles and basic concepts of: drilling engineering, production engineering, phase equilibrium, fluid mechanics and flow through porous media.

PO13. Use specialist computer applications and mathematical models to maximize the performance of all petroleum engineering stages.

PO14. Apply the concepts of project economics and resources evaluation methods for design and decision making under conditions of risk and uncertainty.

7A.4. PET Program Graduation Requirements

Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
PET Specialty Requirements *(sub-section 7A.5.)*	60	42%
PET Sub-Specialty Requirements *(sub-section 7A.6.)*	42	29%
Total	144	100%

7A.5. Petroleum Engineering Specialty Requirements *(60 CH)*

No.	Code	Course Title	CH
1	EED217	Electrical Engineering	3
2	EED374	Machine Learning and Pattern Recognition	3
3	EMP213	Differential Equations	3
4	EMP251	Organic Chemistry	3
5	MEC231	Thermodynamics	3
6	MEC232	Fundamentals of Fluid Science	3
7	MEC253	Mechanical Engineering Drawing	2
8	MEC254	Material Science and Stress Analysis	3
9	MEC344	Fundamentals of Heat Transfer	3
10	MEC349	Sustainable and Renewable Energy Sources	3
11	PET211	Introduction to Petroleum Engineering	3
12	PET212	Drilling Engineering I	3
13	PET241	General Geology	2
14	PET242	Structural Geology and Sedimentology	3
15	PET321	Production Optimization and Well Performance	3
16	PET331	Reservoir Rock and Fluids Properties	3
17	PET351	Petroleum Refining and Petrochemical Engineering	3

18	PET352	Natural Gas Engineering and Processing	3
19	PET361	Economics and Agreements	3
20	PET498	Graduation Project 1	2
21	PET499	Graduation Project 2	3
		Subtotal	**60**

7A.6. Petroleum Engineering Sub-Specialty Requirements *(42 CH)*

7A.6.1. PET Compulsory Courses List *(27 CH)*

No.	Code	Course Title	CH
1	PET314	Drilling Engineering II	3
2	PET322	Artificial Lift Technology	3
3	PET324	Well Completion and Workover	3
4	PET332	Petroleum Reservoir Engineering	3
5	PET333	Formation Evaluation with Well Logging	3
6	PET343	Petroleum Geology and Exploration	3
7	PET433	Well Testing Analysis	3
8	PET434	Reservoir Simulation	3
9	PET435	Enhanced Oil Recovery	3
		Subtotal	**27**

7A.6.2. PET Elective Courses *(15 CH)*

Group A *(6 CH)*

Two courses (Dept. Electives A1& A2) are to be selected from this list

No.	Code	Course Title	CH	Perquisites
1	PET415	Advanced Drilling Technology	3	PET314
2	PET425	Surface Production Operation	3	PET321
3	PET436	Reservoir Characterization	3	PET332
4	PET471	Digital Applications in Petroleum Engineering	3	-

Group B *(6 CH)*

Two courses (Dept. Electives B1 & B2) are to be selected from this list

No.	Code	Course Title	CH	Perquisites
1	PET472	Greenhouse Technology and Emission Reduction	3	-
2	PET473	Energy Plant Engineering and Maintenance	3	-
3	PET474	Geo-Energy Storage Systems	3	-
4	PET475	Energy & Unconventional Resources	3	-

Group C *(3 CH)*

One course (Dept. Elective C1) is to be selected from this list

No.	Code	Course Title	CH	Perquisites
1	PET476	Petroleum and Sustainability	3	-
2	PET477	Selected topics in Sustainable Energy	3	-
3	PET478	Environmental Engineering and Safety	3	-

7A.7. PET Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	9	3	25	

Second Semester

(Common to All Petroleum Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	6	6	25	

CH	Credit Hours	Lec	Lecture hours / Week
ECTS	European Credit Transfer System	Tut	Tutorial hours / Week
SWL	Student Workload / Semester	Lab	Laboratory hours / Week
		TT	Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(Petroleum Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EMP213	Differential Equations	**3**	5	125	2	2	0	4	-
2	MEC232	Fundamentals of Fluid Science	**3**	5	125	2	2	1	5	EMP123
3	MEC253	Mechanical Eng. Drawing	**2**	4	100	1	0	3	4	EMP141
4	MEC254	Material Science and Stress Analysis	**3**	5	125	2	2	0	4	-
5	PET211	Introduction to Petroleum Eng.	**3**	5	125	2	3	0	5	-
6	PET241	General Geology	**2**	3	75	2	0	0	2	-
7	PSC 110	Human Rights	**2**	3	75	2	0	0	2	-
		Total	**18**	**30**	**750**	**13**	**9**	**4**	**26**	

Fourth Semester

(Petroleum Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED217	Electrical Engineering	**3**	5	125	2	2	0	4	EMP124
2	EMP251	Organic Chemistry	**3**	5	125	2	1	2	5	EMP151
3	FAC E1	Faculty Elective	**2**	3	75	2	0	0	2	-
4	MEC231	Thermodynamics	**3**	5	125	2	2	1	5	EMP123
5	PET212	Drilling Engineering I	**3**	5	125	2	2	1	5	PET211
6	PET242	Structural Geology and Sedimentology	**3**	5	125	2	2	0	4	PET241
7	UNV E3	University Elective 3	**2**	3	75	2	0	0	2	-
		Total	**19**	**31**	**775**	**14**	**9**	**4**	**27**	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Petroleum Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	MEC344	Fundamentals of Heat Transfer	**3**	5	125	2	2	0	4	-
2	PET314	Drilling Engineering II	**3**	5	125	2	2	1	5	PET212
3	PET321	Production Optimization and Well Performance	**3**	5	125	2	2	0	4	PET211
4	PET331	Reservoir Rock and Fluids Properties	**3**	5	125	2	2	1	5	PET211
5	PET343	Petroleum Geology and Exploration	**3**	5	125	2	2	0	4	PET242
6	PET351	Petroleum Refining and Petrochemical Engineering	**3**	5	125	2	2	0	4	EMP251
		Total	**18**	**30**	**750**	**12**	**12**	**2**	**26**	

Sixth Semester

(Petroleum Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	PET322	Artificial Lift Technology	**3**	5	125	2	2	0	4	PET321
2	PET324	Well Completion and Workover	**3**	5	125	2	2	0	4	PET314
3	PET332	Petroleum Reservoir Engineering	**3**	5	125	2	2	0	4	PET331
4	PET333	Formation Evaluation with Well Logging	**3**	5	125	2	2	1	5	PET331
5	PET352	Natural Gas Engineering and Processing	**3**	5	125	2	2	0	4	-
6	PET361	Economics and Agreements	**3**	5	125	2	2	0	4	-
		Total	**18**	**30**	**750**	**12**	**12**	**1**	**25**	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75 Training Hours (3 Weeks × 25 hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Petroleum Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	MEC349	Sustainable and Renewable Energy Sources	**3**	5	125	2	2	0	4	-
2	PET A1	Dept. Elective A1	**3**	5	125	2	2	0	4	See 7A.5.2.
3	PET B1	Dept. Elective B1	**3**	5	125	2	2	0	4	See 7A.5.2.
4	PET433	Well Testing Analysis	**3**	5	125	2	2	0	4	PET332
5	PET434	Reservoir Simulation	**3**	5	125	2	2	1	5	PET332
6	PET498	Graduation Project 1	**2**	4	100	1	0	3	4	Approval
		Total	**17**	**29**	**725**	**11**	**10**	**4**	**25**	

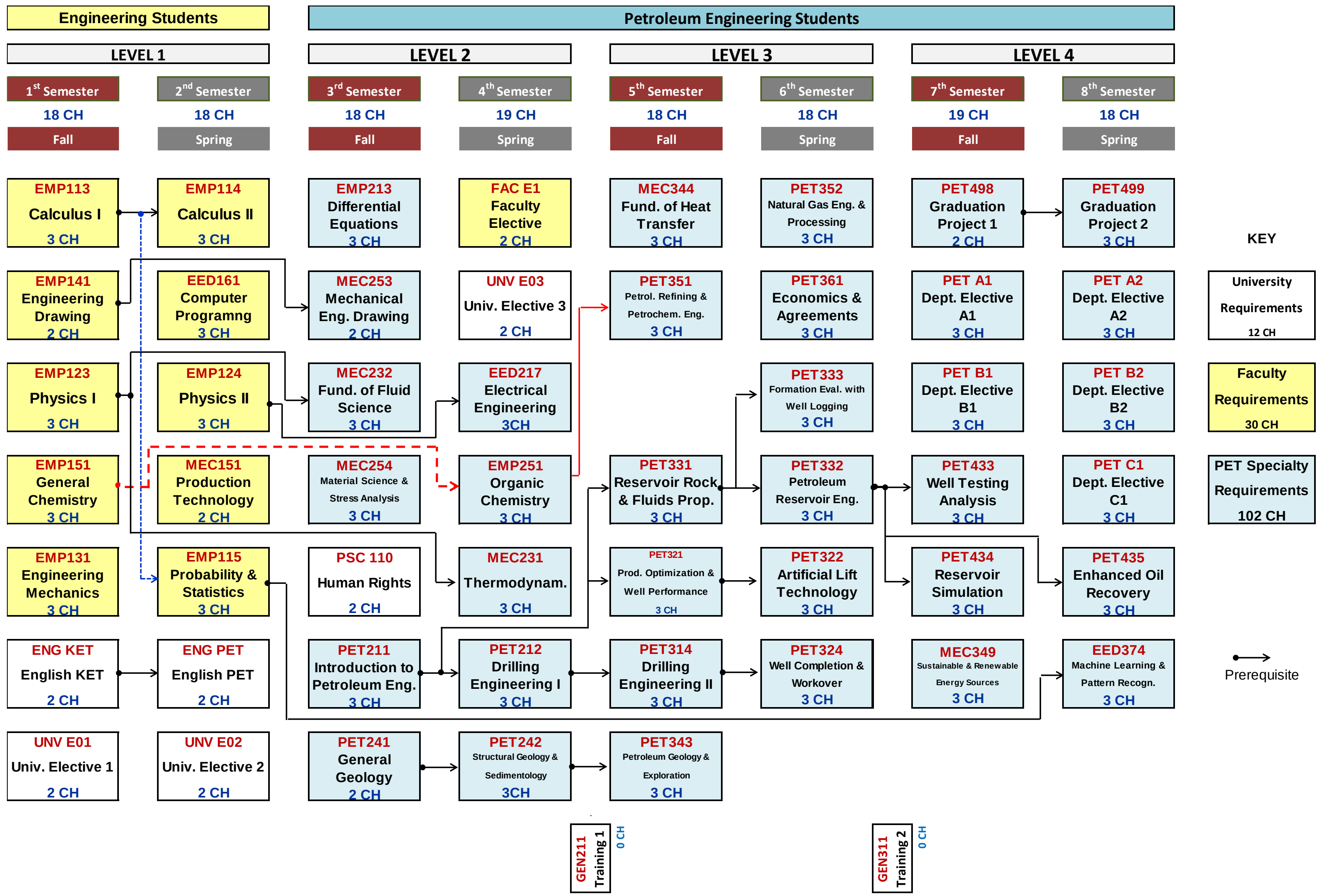
Eighth Semester

(Petroleum Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED374	Machine Learning and Pattern Recognition	**3**	5	125	2	1	2	5	EMP115
2	PET A2	Dept. Elective A2	**3**	5	125	2	2	0	4	See 7A.5.2.
3	PET B2	Dept. Elective B2	**3**	5	125	2	2	0	4	See 7A.5.2.
4	PET C1	Dept. Elective C1	**3**	5	125	2	2	0	4	See 7A.5.2.
5	PET435	Enhanced Oil Recovery	**3**	5	125	2	2	0	4	PET332
6	PET499	Graduation Project 2	**3**	5	125	1	0	6	7*	PET498
		Total	**18**	**30**	**750**	**11**	**9**	**8**	**28**	

* *This number does not account for the contact hours during the 3 weeks following the final exams*

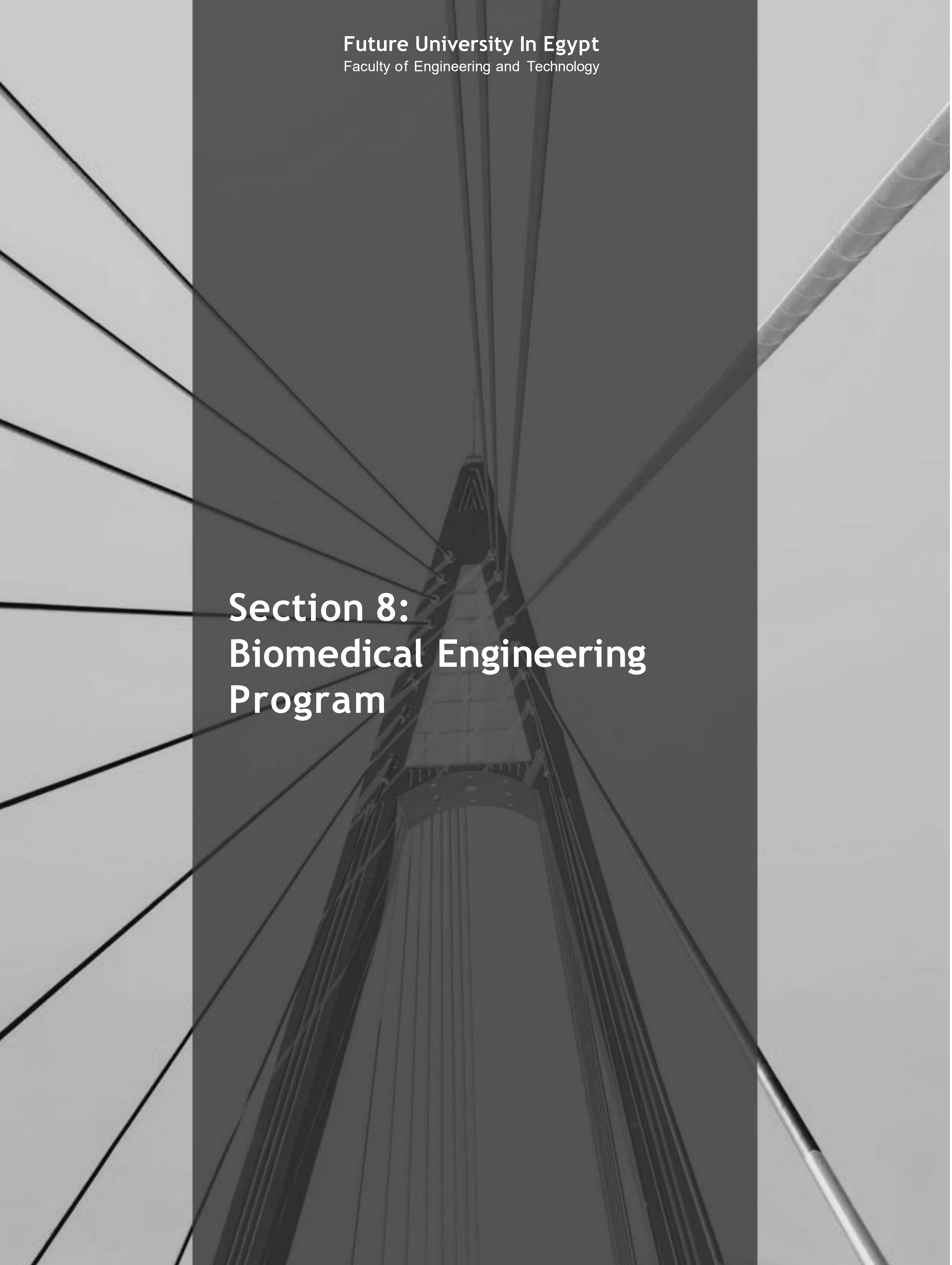
7A.8. PET Program Courses' Tree Diagram



7A.9. PET Program Courses Mapped to Program Outcomes (Competencies)

E2- Petroleum Engineering Courses Mapped to Program Outcomes Levels A &B

Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16
EED217	Electrical Engineering	■	■								■					■	
EED374	Machine Learning & Pattern Recognition					■			■		■			■			■
EMP213	Differential Equations	■									■			■			
EMP251	Organic Chemistry	■	■								■					■	
MEC231	Thermodynamics	■		■							■					■	
MEC232	Fundamentals of Fluid Science	■		■							■					■	
MEC253	Mechanical Engineering Drawing	■		■			■			■	■					■	
MEC254	Material science and Stress Analysis	■		■							■					■	
MEC344	Fundamentals of Heat Transfer	■		■							■					■	
MEC349	Sustainable & Renewable Energy Sources	■	■	■		■		■	■		■						
PET211	Introduction to Petroleum Engineering	■		■	■							■	■	■		■	
PET212	Drilling Engineering I	■	■	■	■			■					■				■
PET241	General Geology		■					■	■			■					
PET242	Structural Geology and Sedimentology		■					■	■			■					
PET314	Drilling Engineering II	■	■	■	■			■					■				■
PET321	Production Optimization and Well Performanc	■		■	■	■	■	■					■			■	■
PET322	Artificial Lift Technology	■		■	■		■	■					■			■	■
PET324	Well Completion and Workover	■		■	■		■	■					■			■	■
PET331	Reservoir Rock and Fluids Properties	■	■	■	■			■				■					■
PET332	Petroleum Reservoir Engineering	■	■	■	■		■	■				■			■	■	
PET333	Formation Evaluation with Well Logging	■	■		■	■		■			■	■		■		■	■
PET343	Petroleum Geology and Exploration		■			■	■	■	■			■					
PET351	Petroleum Refining and Petrochemical Eng.	■		■					■	■				■		■	
PET352	Natural Gas Engineering and Processing	■		■					■	■		■		■		■	
PET361	Economics and Agreements	■		■	■		■	■			■			■	■	■	
PET415	Advanced Drilling Technology	■		■	■	■		■			■		■				■
PET425	Surface Production Operation	■		■	■		■	■					■				■
PET433	Well Testing Analysis	■		■		■	■	■				■			■	■	
PET434	Reservoir Simulation		■	■			■		■	■	■	■		■	■		■
PET435	Enhanced Oil Recovery	■		■					■	■		■		■		■	
PET436	Reservoir Characterization	■			■	■			■	■		■					■
PET471	Digital Applications in Petroleum Engineering	■			■			■		■	■			■			■
PET472	Greenhouse Technology & Emission Reduction			■	■			■	■						■	■	
PET473	Energy Plant Engineering and Maintenance	■		■	■				■	■					■	■	
PET474	Geo-Energy Storage Systems			■	■					■	■				■	■	
PET475	Energy & Unconventional Resources			■	■			■		■					■	■	
PET476	Petroleum and Sustainability			■	■		■			■	■				■	■	
PET477	Selected topics in Sustainable Energy			■	■	■	■				■				■	■	
PET478	Environmental Engineering and Safety	■		■	■	■	■				■			■		■	
PET498	Graduation Project 1		■		■	■		■	■	■	■	■	■	■	■	■	■
PET499	Graduation Project 2		■		■	■		■	■	■	■	■	■	■	■	■	■



Section 8: Biomedical Engineering Program

8. BIOMEDICAL ENGINEERING DEPARTMENT

MAJOR PROGRAMS

8.0 Biomedical Engineering Dept. Course Coding

B	M	E		x	

x → Specialization

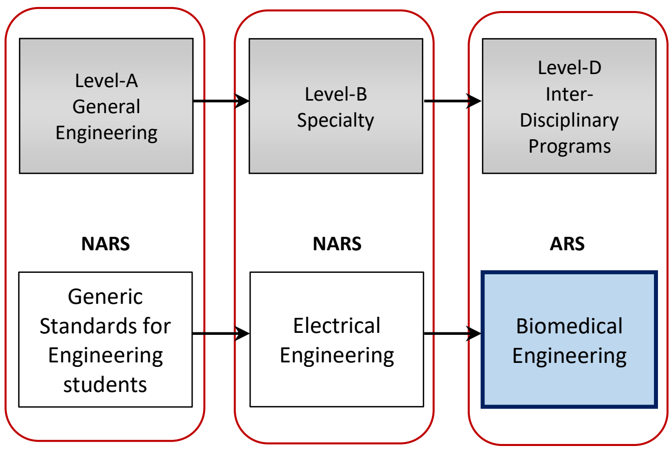
x	Specialization
1	Bio-electronic sensor systems
2	biomaterials/biomechanics
3	Biological systems
4	medical data processing
5	Healthcare technology systems
6	Biotechnologies
9	Projects

8A. BIOMEDICAL ENGINEERING (BME) PROGRAM

8A.1. BME Academic Standards

The Faculty of Engineering & Technology at FUE adopts the general Engineering National Academic Reference Standards **NARS-2018** for the B.Sc. degree of Engineering, published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE), along withthe relevant NARS for the Electrical Engineering, andthe Academic Reference Standard (**ARS**) for the "***Biomedical Engineering***" program, developed by the Faculty.

NATIONAL ACADEMIC REFERENCE STANDARDS (**NARS**)
AND ACADEMIC REFERENCE STANDARDS (**ARS**)



Different Levels of Competencies, as per NAQAAE

Also, the development of the program considers the conditions and constraints specified by theAccreditation Board for Engineering and Technology (ABET): criteria for accrediting Engineering Programs", 2024-2025 Accreditation Cycle, November 2023.

8A.2. BME Graduate Attributes

The graduate of the biomedical engineering program must:

GA1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.

GA2. Apply analytic, critical, and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to engineering ethics and standards.

GA4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.

GA5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community.

GA6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.

GA7. Use techniques, skills and modern engineering tools necessary for engineering practice.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.

GA9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.

GA10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

8A.3. BME Program Outcomes *(Levels A, B, and D)*

The Biomedical Engineering graduate must be able to:

General Outcomes for BME Program (Level A - Engineering)

PO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

PO2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

PO3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

PO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

PO5. Practice research techniques and methods of investigation as an inherent part of learning.

PO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

PO7. Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

PO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

PO9. Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

PO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Specialization Outcomes for BME Program (Level B - Electrical engineering)

PO11. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.

PO12. Design, model and analyze an electrical/electronic/digital/biomedical system or component for a specific application; and identify the tools required to optimize this design.

PO13. Design and implement: elements, modules, sub-systems or systems in electrical/ electronic/digital/biomedical engineering using technological and professional tools.

PO14. Estimate and measure the performance of an electrical/electronic/digital/biomedical system and circuit under specific input excitation, and evaluate its suitability for a specific application.

PO15. Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital/biomedical equipment, systems and services.

Inter-Disciplinary Outcomes for BME Program (Level D - Biomedical engineering)

PO16. Plan and manage engineering activities during diverse implementation phases of the biomedical engineering equipment, sub-systems, and systems; prepare and present relevant technical reports.

PO17. Identify and use the appropriate software packages for the purpose of simulation, analysis, design, and/or control of a specific biomedical engineering systems application.

PO18. Investigate the defects and failures of components, systems, and processes based on appropriate fault diagnosis methodology, software tools and/or measuring instruments.

PO19. Integrate components and sub-systems to build up an assigned system with specific requirements considering compatibility constraints.

PO20. Identify and correlate structures and functions of human body components to engineering principles.

8A.4. BME Program Graduation Requirements

BME Program Requirements	CH	%
University Requirements *(sub-section 2A.3.)*	12	8%
Faculty Requirements *(sub-section 2A.4.)*	30	21%
EE Specialty Requirements *(sub-section 8A.5.)*	60	42%
BME Inter-Disciplinary Requirements *(sub-section 8A.6.)*	42	29%
Total	144	100%

8A.5. Electrical Engineering Specialty Requirements *(60 CH)*

No.	Code	Course Title	CH
1	EED211	Electrical Circuits 1	3
2	EED212	Electrical Circuits 2	3
3	EED213	Electronics	3
4	EED222	Logic Design	3
5	EED223	Computer Organization	3
6	EED231	Signals and Systems	3
7	EED311	Electronic Circuits	4
8	EED314	Measurements and Instrumentation	3
9	EED323	Microprocessors and Microcontrollers	3
10	EED331	Electromagnetic Fields	3
11	EED344	Electrical Power Engineering	3
12	EED355	Control Systems	3
13	BME498	Graduation Project 1	2
14	BME499	Graduation Project 2	3
15	EMP213	Differential Equations	3
16	EMP214	Transformations and Complex Analysis	3
17	EMP216	Discrete Math and Numerical methods	3
18	EMP227	Solid State Physics	3
19	BME231	Biology	3
17	BME331	Anatomy &physiology	3
		Subtotal	60

8A.6. Biomedical Engineering Inter-Disciplinary Requirements *(42 CH)*

8A.6.1 BME Compulsory Courses List *(27 CH)*

No.	Code	Course Title	CH
1	BME311	Biomedical Instrumentation	3
2	BME312	Medical Electronics	3
3	BME321	Biomaterials	3
4	BME341	Medical Signal Processing	3
5	BME342	Medical Image Processing	3
6	BME411	Biomedical Equipment	3
7	BME421	Stress Analysis	3
8	BME422	Biomechanics	3
9	BME451	Clinical Engineering	3
		Subtotal	27

8A.6.2 BME Elective Courses List *(15 CH)*

Five courses (Technical Electives E1-E5) are to be selected from this list

No.	Code	Course Title	CH	Prerequisite Courses
1	BME412	Advanced Biomedical Equipment	3	BME411
2	BME441	Bioinformatics	3	EMP115
3	BME442	Analytical Instruments and Bioanalysis	3	BME341
4	BME443	Advanced Medical Image Processing	3	BME342
5	BME444	Biometrics	3	BME341 BME342
6	BME452	Hospital Design and Management	3	BME411
7	BME461	Selected Topics in Biomedical Eng.	3	As advised
8	BME462	Nanophysics and Nanotechnology	3	BME321
9	BME463	Plasma technology in Biomedical Engineering	3	EMP227
10	BME464	Computer Aided Design	3	EED161
11	BME465	Laser and Fiber Optics in Biomedical Engineering	3	EED331
12	BME466	The Internet of Things in Medicine and Biology	3	BME411

8A.7. BME Program Study Plan

Level 1 (Freshman)

First Semester

(Common to All Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	TT	
1	EMP113	Calculus I	**3**	5	125	2	2	0	4	-
2	EMP123	Physics I	**3**	5	125	2	2	1	5	-
3	EMP131	Engineering Mechanics	**3**	5	125	2	2	0	4	-
4	EMP141	Engineering Drawing	**2**	4	100	1	3	0	4	-
5	EMP151	General Chemistry	**3**	5	125	2	0	2	4	-
6	ENG KET	English KET	**2**	3	75	2	0	0	2	-
7	UNV E1	University Elective 1	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	9	3	25	

Second Semester

(Common to All Electrical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec	Tut	Lab	TT	
1	EED161	Computer Programming	**3**	5	125	2	0	2	4	-
2	EMP114	Calculus II	**3**	5	125	2	2	0	4	EMP113
3	EMP115	Probability & Statistics	**3**	5	125	2	2	0	4	EMP113
4	EMP124	Physics II	**3**	5	125	2	2	1	5	-
5	ENG PET	English PET	**2**	3	75	2	0	0	2	ENG KET
6	MEC151	Production Technology	**2**	4	100	1	0	3	4	-
7	UNV E2	University Elective 2	**2**	3	75	2	0	0	2	-
		Total	**18**	30	750	13	6	6	25	

CH Credit Hours
ECTS European Credit Transfer System
SWL Student Workload / Semester

Lec Lecture hours / Week
Tut Tutorial hours / Week
Lab Laboratory hours / Week
TT Total contact hours / Week

Level 2 (Sophomore)

Third Semester

(Biomedical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	BME231	Biology	**3**	5	125	2	2	0	4	-
2	EED211	Electrical Circuits 1	**3**	5	125	2	2	1	5	EMP124
3	EED222	Logic Design	**3**	5	125	2	2	1	5	-
4	EMP213	Differential Equations	**3**	5	125	2	2	0	4	EMP114
5	EMP227	Solid State Physics	**3**	5	125	2	2	1	5	EMP124
6	PSC 110	Human Rights	**2**	3	75	2	0	0	2	-
7	UNV E3	University Elective 3	**2**	3	75	2	0	0	2	-
		Total	**19**	31	775	14	10	3	27	

Fourth Semester

(Biomedical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	EED212	Electrical Circuits 2	**3**	5	125	2	2	1	5	EED211
2	EED213	Electronics	**3**	5	125	2	2	1	5	EMP227
3	EED223	Computer Organization	**3**	5	125	2	2	1	5	EED222
4	EED231	Signals & Systems	**3**	5	125	2	2	1	5	EMP213
5	EMP214	Transformations and Complex Analysis	**3**	5	125	2	2	0	4	EMP213
6	EMP216	Discrete Math and Numerical methods	**3**	5	125	2	2	0	4	EMP213
		Total	**18**	30	750	12	12	4	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN211	Practical Training 1	75Training Hours (3 Weeks ×25hrs/Week)	**0**	Completion of 54 CH

Level 3 (Junior)

Fifth Semester

(Biomedical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	BME331	Anatomy and Physiology	**3**	5	125	2	1	1	4	-
2	EED311	Electronic Circuits	**4**	6	150	3	2	1	6	EED213
3	EED314	Measurements & Instrumentation	**3**	5	125	2	1	2	5	EED213
4	EED323	Microprocessors and Microcontrollers	**3**	5	125	2	2	1	5	EED223
5	EED331	Electromagnetic Fields	**3**	5	125	2	2	0	4	EMP214
6	EED355	Control Systems	**3**	5	125	2	2	0	4	EMP214
		Total	**19**	31	775	13	10	5	28	

Sixth Semester

(Biomedical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	BME E1	Technical Elective 1	**3**	5	125	2	2	0	4	See 8A.6.2.
2	BME311	Biomedical Instrumentation	**3**	5	125	2	2	1	5	EED314
3	BME312	Medical Electronics	**3**	5	125	2	2	1	5	EED311
4	BME321	Biomaterials	**3**	5	125	2	2	0	4	BME331
5	BME341	Medical Signal Processing	**3**	5	125	2	2	1	5	EED231
6	BME342	Medical Image Processing	**3**	5	125	2	2	1	5	EED231
		Total	**18**	30	750	12	12	4	28	

Summer Training

No	Course		Contact Hours	CH	Prerequisite Courses
	Code	Title			
1	GEN311	Practical Training 2	75Training Hours (3 Weeks ×25hrs/Week)	**0**	Completion of 90 CH

Level 4 (Senior)

Seventh Semester

(Biomedical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	BME E2	Technical Elective 2	**3**	5	125	2	2	0	4	See 8A.6.2.
2	BME E3	Technical Elective 3	**3**	5	125	2	2	0	4	See 8A.6.2.
3	BME411	Biomedical Equipment	**3**	5	125	2	2	0	4	BME331
4	BME421	Stress Analysis	**3**	5	125	2	2	0	4	BME331
5	BME498	Graduation Project 1	**2**	4	100	1	0	3	4	Completion of 100 CH
6	EED344	Electrical Power Engineering	**3**	5	125	2	2	0	4	EED212
		Total	**17**	29	725	11	10	3	24	

Eighth Semester

(Biomedical Engineering Students)

#	Course		Credits			Weekly Contact Hours				Prerequisite Course
	Code	Title	CH	ECTS	SWL	Lec.	Tut.	Lab.	Total	
1	BME E4	Technical Elective 4	**3**	5	125	2	2	0	4	See 8A.6.2.
2	BME E5	Technical Elective 5	**3**	5	125	2	2	0	4	See 8A.6.2.
3	BME422	Biomechanics	**3**	5	125	2	2	1	5	BME421
4	BME451	Clinical Engineering	**3**	5	125	2	2	1	5	BME411
5	BME499	Graduation Project 2	**3**	5	125	1	0	6	7	BME498
6	FAC E1	Faculty Elective	**2**	4	100	2	0	0	2	-
		Total	**17**	29	725	11	8	8	27	

* *This number does not account for the contact hours during the 3 weeks following the final exams*

8A.8. BME Program Courses' Tree Diagram

Engineering Students+C4:S24		Electrical Engineering Students		Electrical Power Engineering Students				
LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester	
18 CH	18 CH	19 CH	18 CH	19 CH	18 CH	17 CH	17 CH	
Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	KEY
EMP113 Calculus I 3 CH	EMP114 Calculus II 3 CH	EMP213 Differential Equations 3 CH	EMP214 Transform. & Complx Anal. 3 CH	EED331 EM Fields 3 CH	BME342 Medical Image. Processing 3 CH	BME498 Graduation Project 1 2 CH	BME499 Graduation Project 2 3 CH	
EMP131 Engineering Mechanics 3 CH	EMP115 Probability & Statistics 3 CH	PSC 110 Human Rights 2 CH	EMP216 Discrete Math. & Numerical M. 3 CH	EED355 Control Systems 3 CH	BME341 Medical signal process 3 CH	BME421 Stress analysis 3 CH	BME422 Biomechanics 3 CH	University Requirements 12 CH
ENG KET English KET 2 CH	ENG PET English PET 2 CH	BME231 Biology 3 CH	EED231 Signals & Systems 3 CH	BME331 Anatomy & Physiology 3 CH	BME321 Biomaterials 3 CH	BME411 Biomed. equip 3 CH	BME451 Clinical eng. 3 CH	Faculty Requirements 30 CH
EMP123 Physics I 3 CH	EMP124 Physics II 3 CH	EED211 Electrical Circuits 1 3 CH	EED212 Electrical Circuits 2 3 CH	EED314 Measuremnt & Instrument. 3 CH	BME311 Biomedical instrument. 3 CH	EED344 Electrical Power Eng. 3 CH	BME E4 Technical Eelective 4 3 CH	EE Specialty Requirements 60 CH
EMP141 Engineering Drawing 2 CH	MEC151 Production Technology 2 CH	EMP227 Solid-State Physics 3 CH	EED213 Electronics 3 CH	EED311 Electronic Circuits 4 CH	BME312 Medical Electronics 3 CH	BME E2 Technical Eelective 2 3 CH	BME E5 Technical Eelective 5 3 CH	BME Inter-Disciplinary Requirements 42 CH
EMP151 General Chemistry 3 CH	EED161 Computer Programng. 3 CH	EED222 Logic Design 3 CH	EED223 Computer Organization 3 CH	EED323 µProcessors & µControllers 3 CH	BME E1 Technical Eelective 1 3 CH	BME E3 Technical Eelective 3 3 CH	FAC E1 Faculty Elective 2 CH	
UNV E1 Univ. Elective 1 2 CH	UNV E2 Univ. Elective 2 2 CH	UNV E3 Univ. Elective 3 2 CH	GEN211 Training 1 0 CH		GEN311 Training 2 0 CH			

8A.9. BME Program Courses Mapped to Program Outcomes (competencies)

Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PO16	PO17	PO18	PO19	PO20
EED211	Electrical Circuits 1	■	■					■							■						
EED212	Electrical Circuits 2	■	■					■							■						
EED213	Electronics		■			■			■				■	■	■						
EED222	Logic Design	■	■										■								
EED223	Computer Organization		■	■									■	■							
EED231	Signals & Systems	■													■						
EED311	Electronic Circuits	■	■		■								■	■	■						
EED314	Measurements & Instrumentation		■		■									■	■						
EED323	Microprocessors & Microcontrollers		■	■	■					■	■		■			■					
EED331	Electromagnetic Fields	■										■									
EED344	Electrical Power Engineering	■					■	■	■			■				■					
EED355	Control Systems	■		■					■						■						
BME498	Graduation Project 1					■	■	■	■		■		■	■	■	■	■	■	■	■	
BME499	Graduation Project 2					■	■	■	■	■			■	■	■	■	■	■	■	■	
EMP213	Differential Equations	■										■	■								
EMP214	Transformations & Complex Analys	■											■								
EMP216	Discrete Math and Numerical metho	■											■								
EMP227	Solid State Physics	■								■				■							
BME231	Biology	■							■	■			■								■
BME331	Anatomy & Physiology	■						■	■	■											■
BME311	Biomedical Instrumentation				■							■	■			■			■		
BME312	Medical Electronics			■								■	■			■	■	■	■	■	
BME321	Biomaterials	■		■							■		■								■
BME341	Medical Signal Processing		■									■	■	■				■			
BME342	Medical Image Processing		■									■	■	■				■		■	
BME411	Biomedical Equipment				■							■	■			■			■		
BME421	Stress Analysis	■							■				■			■					■
BME422	Biomechanics	■		■											■	■					■
BME451	Clinical Engineering	■		■		■		■	■			■			■			■	■		

Section 9:
Minor Programs

9. MINOR PROGRAMS

9A. Environmental Landscape Architecture **9B. GIS for Smart Cities** **9C. Interior Architecture Engineering**	**Architectural Engineering Dept.**
9D. Intelligent Systems Engineering	**Electrical Engineering Dept.**
9E. Robotic Automation Engineering **9F. Sustainable Energy Engineering**	**Mechanical Engineering Dept.**
9G. Engineering Project Management	**Structural Engineering and Construction Management Dept.**
9H. Petroleum Engineering	**Petroleum Engineering Dept.**
9I. Biomedical Engineering	**Biomedical Engineering Dept.**

9A. ENVIRONMENTAL LANDSCAPE ARCHITECTURE (Minor)

9A.1. Program Outcomes

A graduate with an Environmental Landscape Architecture Minor must be able to:
Apply Environmental Landscape Architecture principles and techniques to analyze, solve problems of, and/or design the solutions related to his specialization.

9A.2. Program Enrollment Requirements

This minor program is open for students enrolled in the following major programs:

1. Architectural Engineering (ARE)
2. Interior Architecture Engineering (IAE)

9A.3. Required Courses

To qualify for a minor, students must complete an additional 18 credit hours in one extra semester to be selected from the following list, including 5 credit hours dedicated to the project.

No.	Code	Course Title	CH
1	ARC328	Histories of Landscape Architecture	2
2	ARC429	Healing Landscape	3
3	ARC445	Landscape Construction Design	3
4	ARC451	Landscape & Site Planning	3
5	ARC357	Landscape Planting Design	2
6	ARC459	Reading the Contemporary Landscape	3
7	ARC461	Environmental & Building Performance	3
8	ARC363	Material Studies & Environmental Design	2
9	ARC463	Zero-Plus Energy Buildings	3
10	ARC364	Climate, Energy, & Architecture	2
11	ARC465	Environmental Architecture Design Techniques	3
12	ARC493	Environmental Landscape Architecture Project	5

9B. GIS FOR SMART CITIES (Minor)

9B.1. Program Outcomes

A graduate with a GIS for Smart Cities Minor must be able to:
Apply GIS for Smart Cities principles and techniques to analyze, solve problems of, and/or design the solutions related to his specialization.

9B.2. Program Enrollment Requirements

This minor program is open for students enrolled in the following major programs:

1. Architectural Engineering (ARE)
2. Interior Architectural Engineering (IAE)
3. Structural Engineering and Construction Management (SCM)

9B.3. Required Courses

To qualify for a minor, students must complete an additional 18 credit hours in one extra semester to be selected from the following list, including 5 credit hours dedicated to the project.

No.	Code	Course Title	CH
1	ARC426	Smart Cities and the Future of Transport Systems	2
2	ARC327	Special Topics in Sustainable Urban Mobility Planning	2
3	ARC436	Geographic Information System (GIS)	3
4	ARC337	Introduction to Building Information Modeling (BIM) and Geographic Information Systems (GIS)	2
5	ARC338	Digital Twin Applications in Architecture and Urbanism using GIS and BIM [GeoBIM]	2
6	ARC439	Special topics in GIS & BIM	2
7	ARC454	Sustainable Urban Mobility and Green Energy	2
8	ARC455	City Planning and Urban Mobility	3
9	ARC456	Transportation and Land Use Planning	3
10	ARC481	Geospatial Analysis for Risk and Performance Management in Architecture	3
11	ARC482	Integrated Project Coordination and Site Management Using GIS & BIM [GeoBIM]	3
12	ARC483	GeoBIM for Sustainable Development Goals (SDGs): Asset and Facilities Management	3
13	ARC494	GIS for Smart Cities Project	5

9C. INTERIOR ARCHITECTURE ENGINEERING (Minor)

9C.1. Program Outcomes

A graduate with an Interior Architecture Engineering Minor must be able to:
Apply Interior Architecture Engineering principles and techniques to analyze, solve problems of, and/or design the solutions related to his specialization.

9C.2. Program Enrollment Requirements

This minor program is open for students enrolled in the following major programs:

1. Architectural Engineering (ARE)

9C.3. Required Courses

To qualify for a minor, students must complete an additional 18 credit hours in one extra semester to be selected from the following list, including 5 credit hours dedicated to the project.

No.	Code	Course Title	CH
1	ARC322	History & Theories of Interior Design	2
2	ARC361	Interior Design with Light and Sound	3
3	ARC376	Interior Design Styles and Trends	2
4	ARC415	Residential and Hospitality Interior Design	3
5	ARC321	Furniture Designers and Brands	2
6	ARC324	Furniture Mockups (Colors & Materials)	2
7	ARC431	Visualizing Furniture: Design & Drawings	3
8	ARC441	Built-in Cabinet, Lighting & Styling	3
9	ARC471	Furniture Production and Technical Drawings	3
10	ARC495	Applied Project in Interior Design	5

9D. INTELLIGENT SYSTEMS ENGINEERING (Minor)

9D.1. Program Outcomes

The graduate with Intelligent Systems Engineering Minor must be able to:
Apply artificial intelligence principles and machine learning techniques to analyze, solve problems of, and/or design the applications related to his specialization.

9D.2. Program Enrollment Requirements

This minor program is open to the students enrolled in the following major programs:

1. Architectural Engineering (ARE)
2. Interior Architecture Engineering (IAE)
3. Electrical Power Engineering (EPE)
4. Electronics and Communication Engineering (ECE)
5. Mechatronics Engineering (MEC)
6. Sustainable Energy Engineering (SEE)
7. Structural Engineering & Construction Management (SCM)
8. Petroleum Engineering (PET)
9. Biomedical Engineering (BME)

9D.3. Required Courses

9D.3.1. Compulsory Courses (18 CH)

No.	Code	Course Title	CH
1	EED261	Advanced Computer Programming	3
2	EED371	Artificial Intelligence	3
3	EED374	Machine Learning and Pattern Recognition	3
4	EED474	Computational Intelligence	3
5	EED475	Fundamentals of Deep Learning	3
6	EMP216	Discrete Mathematics & Numerical Methods	3

9D.3.2. Elective Courses

None

9E. ROBOTIC AUTOMATION ENGINEERING (Minor)

9E.1. Program Outcomes

Robotic Automation Engineering program should equip graduates with a strong foundation in robotics, automation, and related technologies. The following competencies are essential for professionals in this field:

1. Human-robot interaction: Design and implement robotic systems that can interact safely and effectively with humans.
2. Autonomous systems: Develop autonomous robotic systems that can operate independently in complex environments.
3. Industrial automation: Apply robotics and automation technologies to manufacturing and industrial processes.
4. Service robotics: Design and implement robotic systems for service applications, such as healthcare, logistics, and agriculture.

By developing these competencies, graduates of Robotic Automation Engineering programs will be well-prepared to contribute to the advancement of robotics technology and its applications in various industries.

9E.2. Program Enrollment Requirements

This minor program is open for the students enrolled in the following major programs:

1. Electrical Power Engineering (EPE)
2. Electronics and Communication Engineering (ECE)
3. Computer and Intelligent Systems Engineering (CIS)
4. Mechatronics Engineering (MEC)
5. Sustainable Energy Engineering (SEE)
6. Biomedical Engineering (BME)

9E.3. Required Courses

9E.3.1. Compulsory Courses (12 CH)

No.	Code	Course Title	CH
1	EED362	Data Structure and Algorithms	3
2	MEC437	Artificial Intelligence for Robotics	3
3	MEC438	Process Planning and Cost Estimation	3
4	MEC352[a]	Mechanical Design 1, OR	3
	MEC472[b]	Industrial Automation Technology (CAD/CAM)	3

a. *For Majors: EPE, ECE, CIS, BME*
b. *For Majors: MEC, SEE*

9E.3.2. Elective Courses (6 CH)

Two courses are to be selected from this list

No.	Code	Course Title	CH
1	MEC432	Intelligent Fault Diagnosis Systems	3
2	MEC473	Reverse Engineering in Mechanical Engineering	3
3	MEC474	Plant Engineering and Maintenance	3
4	MEC475	Industrial Robotics and Material Handling Systems	3
5	MEC476	Wireless Sensors Networks for Robotics	3
6	MEC477	Computer Aided Design	3

9F. SUSTAINABLE ENERGY ENGINEERING (Minor)

9F.1. Program Outcomes

Sustainable Energy Engineering program should equip graduates with a strong foundation in energy systems, renewable energy technologies, energy efficiency, and policy. The following competencies are essential for professionals in this field:

1. Assess the environmental impacts of energy projects and develop mitigation strategies.
2. Evaluate the economic feasibility of energy projects and investments.
3. Analyze energy policies and regulations and assess their effectiveness.
4. Evaluate the sustainability of energy systems and technologies.

By developing these competencies, graduates of Sustainable Energy Engineering program will be well-prepared to address the challenges and opportunities of the energy transition and contribute to a more sustainable future.

9F.2. Program Enrollment Requirements

This minor program is open for the students enrolled in the following major programs:

1. Architectural Engineering (ARE)
2. Electrical Power Engineering (EPE)
3. Electronics and Communication Engineering (ECE)
4. Mechatronics Engineering (MEC)
5. Petroleum Engineering (PET)

9F.3. Required Courses

9F.3.1. Compulsory Courses (12 CH)

No.	Code	Course Title	CH
1	MEC349	Sustainable and Renewable Energy Sources	3
2	MEC342	Solar Thermal Energy	3
3	MEC446	Energy Conversion and Efficiency	3
4	MEC231[a]	Thermodynamics, OR	3
	MEC448[b]	Energy Environment Impact	3

a. *For Majors: ARE, EPE, ECE*
b. *For Majors: MEC, SEE*

9F.3.2. Elective Courses (6 CH)

Two courses are to be selected from this list

No.	Code	Course Title	CH
1	MEC343	Wind Energy Systems	3
2	MEC433	Water Desalination Systems	3
3	MEC441	Photovoltaic Systems	3
4	MEC443	Bioenergy Systems	3
5	MEC444	Hydraulic and Wave Energy	3
6	MEC445	Fuel Cell Technology	3

9G. ENGINEERING PROJECT MANAGEMENT (Minor)

9G.1. Program Outcomes

The graduate with Engineering Project Management Minor must be able to:
Manage, plan, control engineering projects and prepare cost estimate, cash flow, time schedule, and progress reports for such projects.

9G.2. Program Enrollment Requirements

This minor program is open for the students enrolled in the following major programs:

1. Architectural Engineering (ARE)
2. Interior Architecture Engineering (IAE)
3. Electrical Power Engineering (EPE)
4. Electronics and Communication Engineering (ECE)
5. Mechatronics Engineering (MEC)
6. Sustainable Energy Engineering (SEE)
7. Petroleum Engineering (PET)
8. Biomedical Engineering (BME)

9G.3. Required Courses

9G.3.1. Compulsory Courses (18 CH)

No.	Code	Course Title	CH
1	SCM281	Fundamentals of Construction Project Management	3
2	SCM382	Engineering Economics and Finance	3
3	SCM484	Introduction to BIM	3
4	SCM486	Quantity Surveying and Cost Estimation	3
5	SCM387	Resource Management	3
6	SCM388	Construction Technology	3

9G.3.2. Elective Courses

None

9H. PETROLEUM ENGINEERING (Minor)

9H.1. Program Outcomes

The graduate with Petroleum Engineering Minor must be able to:
Familiarize with the principles of petroleum engineering principles, techniques, and machinery, in addition to apply those principles and techniques to analyze, solve problems of, and/or design the applications related to petroleum industry.

9H.2. Program Enrollment Requirements

This minor program is open for the students enrolled in the following major programs:

1. Electrical Power Engineering (EPE)
2. Electronics and Communication Engineering (ECE)
3. Computer and Intelligent Systems Engineering (CIS)
4. Mechatronics Engineering (MEC)
5. Sustainable Energy Engineering (SEE)

9H.3. Required Courses

9H.3.1. Compulsory Courses (18 CH)

No.	Code	Course Title	CH
1	PET211	Introduction to Petroleum Engineering	3
2	PET212	Drilling Engineering I	3
3	PET321	Production Optimization and Well Performance	3
4	PET322	Artificial Lift Technology	3
5	PET331	Reservoir Rock and Fluids Properties	3
6	PET332	Petroleum Reservoir Engineering	3

9H.3.2. Elective Courses

None

9I. BIOMEDICAL ENGINEERING (Minor)

9I.1. Program Outcomes

The graduate with Biomedical Engineering Minor must be able to:
Apply biomedical engineering principles to analyze, solve problems of, and/or design the applications related to his specialization.

9I.2. Program Enrollment Requirements

This minor program is open to the students enrolled in the following major programs:

1. Electrical Power Engineering (EPE)
2. Electronics and Communication Engineering (ECE)
3. Computer and Intelligent Systems Engineering (CIS)

9I.3. Required Courses

9I.3.1. Compulsory Courses (18 CH)

No.	Code	Course Title	CH
1	BME231	Biology	3
2	BME311	Biomedical Instrumentation	3
3	BME312	Medical Electronics	3
4	BME331	Anatomy & Physiology	3
5	BME342	Medical Image Processing	3
6	BME411	Biomedical Equipment	3

9I.3.2. Elective Courses

None

Section 10:
Course Descriptions

10A. Architectural Engineering Course Descriptions

ARCxxx Courses

ARC121	History & Theories of Architecture (1)	2 CH (2,0,0)
Course Contents	The course focuses on creative thinking methods based on the writings of "Edward De Bono". Elements and principles of design, the relation between form and space, defining a space, circulation spaces, and their characteristics. The course also addresses different historical issues in different periods, Ancient Egyptian - Mesopotamia - Greek - Roman - Early Christianity - Byzantine - Renaissance - Baroque and Rococo.	
Prerequisite (s)	None	
Textbook	- Ching, Francis D.K., Architecture Space, Form, and Order. 2014 - Fletcher, Banister. “A History of Architecture”. London: The Royal Institute of British Architects.	
Lab./Computer	--	

ARC131	Graphics & Visual Skills	2 CH (1,3,0)
Course Contents	The course introduces various drawing principles and artistic techniques: Pencil techniques, Pen and ink, Colors and Materials, Scale and composition, Foreground, Middle and background, sketching architectural elements and landscapes, using free hand. Architectural presentation, Shade and shadows of a dot, a line, a surface, and a volume, Shade and shadow of buildings in plans, elevations, perspectives, and layouts. Architectural perspective, one and two vanishing point perspectives.	
Prerequisite (s)	--	
Textbook	- Rendow Yee, *Architectural Drawing a Visual Compendium of Types & Methods*, Wiley & Sons, 2013 - Montague, John – *Basic Perspective*: A visual Approach – 3rd Ed. N.Y.: Wiley & Sons, 1998.	
Lab./Computer work/Project	Emphasis on: “**Sketching Techniques**”	

ARC213	Architectural Design (1)	4 CH (1,6,0)
Course Contents	This course centers on the Creative Thinking design process, focusing on methods for generating innovative ideas and forms. Students will tackle simple functional needs, structures for small-scale buildings, and design problem-solving. The curriculum includes two design projects: the first involves public structures like pavilions or bus stations, while the second focuses on specialized functional units, potentially for design competitions.	
Prerequisite (s)	ARC121	
Textbook	Unwin, Simon: *Exercises in Architecture: Learning to think as an Architect*, Routledge, 2012	
Lab./Computer Work/Project	Emphasis on: “**Creative Thinking and Special Function Requirements**”	

ARC214	Architectural Design (2)	4 CH (1,6,0)

Course Contents	This course explores functional and site considerations in design, emphasizing form and function through problem-solving. Students will analyze spatial qualities and circulation for various buildings like celebrity residences or children's libraries. It introduces advanced structural systems and the "Structure as Form Generator" method to create sophisticated architectural forms. Assignments include student hostels and tourist villages, with two projects: one focusing on form and function, and the second integrating "Structure as Form Generator." Projects may align with local or international competitions, encouraging submissions.
Prerequisite (s)	ARC213
Textbook	Neufert, E.: *Architects' Data; The Handbook of Building Types*, Third Edition, Blackwell Publishing, 2002, The Alden Group Ltd., Oxford & Northampton, metric edition.
Lab./Computer Work/Project	Emphasis on: "**Functional, Site Considerations, and Structure as Form Generator**"

ARC221	**History & Theories of Architecture (2)**	**2 CH (2,0,0)**
Course Contents	The course addresses different historical issues in different periods, Romanesque, Gothic, and Islamic Architecture in Egypt. Also, an introduction to the design standards for designing community facilities, educational, cultural, health, recreational, commercial, administration, and touristic.	
Prerequisite (s)	--	
Textbook	Sir Banister Fletcher: History of Architecture, 1995, United Kingdom. Neufert, E.: *Architects' Data; The Handbook of Building Types*, Third Edition, Blackwell Publishing, 2002, The Alden Group Ltd., Oxford & Northampton, metric edition.	
Lab./Computer	--	

ARC231	**Computer-Aided Drafting**	**2 CH (1,0,2)**
Course Contents	This course teaches students how to draw using computers as a tool for drafting and visualization. It teaches students object creation, editing, and drawing accuracy in 2D and 3D, how to model any object, and how to render it using different techniques, scenes, materials, and mapping.	
Prerequisite (s)	--	
Textbook	Michael Brightman: The SketchUp Workflow for Architecture: Modeling Buildings, Visualizing Design, and Creating Construction Documents with SketchUp Pro and Layout. John Wiley & Sons, 2013	
Lab./Computer work/Project	Emphasis on: "**Digital Tools**"	

ARC243	**Building Construction & Materials (1)**	**3 CH (1,5,0)**
Course Contents	General introduction, Drawing techniques, Abbreviation symbols, Dimensioning, Technical presentation, Understanding types of structures, Wall bearing & skeleton types. Traditional Construction Method; Load-bearing walls. Using brick to build load-bearing elements: foundation design, walls, jack arch floors, vaults, and domes. Introduction to RC skeleton system.	
Prerequisite (s)	--	
Textbook	Minke, Gernot*: Building with Earth*, 3rd. Ed.	
Lab./Computer Work/Project	Emphasis on: "**Building Construction & Materials Technical Drawings**"	

ARC244	Building Construction & Materials (2)	3 CH (1,4,0)
Course Contents	Conventional Construction Method; Skeleton system. Using Reinforced Concrete to construct structural elements. Staircase rules and design. Retaining walls; concrete and masonry. Arches & Lintels, Doors and Windows. The course also covers the basics of designing and executing buildings with large span and high-rise buildings, mainly steel and wood trusses and frames. Also, the course will comprise the design and execution details of space trusses, geodesic domes, tents, tension, and shell structures.	
Prerequisite (s)	ARC243	
Textbook	Chudley, Roy & Greeno, Roger: *Building Construction Handbook*, 10th Ed.	
Lab./Computer Work/Project	Emphasis on: "**Building Construction & Materials Technical Drawings**"	

ARC253	Landscape Architecture	3 CH (2,3,0)
Course Contents	Introduction and Definitions, Landscape processes, Landscape graphics, Basic elements of design, Visual elements of landscape design, Contemporary theories, Sustainability, Regional landscapes, Application through project study, Classification of plants, Significance of plants in the landscape, Plant materials as resources and design elements, Ecological factors, Economic factors, Sustainable planting design, Vegetation of Egyptian environments, Principles of planting design in semi-arid environments, Applications.	
Prerequisite (s)	None	
Textbook	Norman K. Booth: *Basic Elements of Landscape Architectural Design*, Ohio State University, Waveland Press, INC, Illinois, 1990.	
Lab./Computer Work/Project	Emphasis on: "**Landscape Architecture Design**"	

ARC271	Building Information Modeling (BIM)	2 CH (1,0,2)
Course Contents	This course introduces Building Information Modeling (BIM) using applications such as Autodesk Revit. Students will learn 3D computer modeling techniques, including modeling commands, assigning materials and structural layers, and adding building components. The course also covers conceptual massing tools and presentation skills for both the design and execution phases of projects. Students will explore various BIM software applications and their uses across the architecture, engineering, and construction (AEC) industry. Advanced render tools may be introduced such as "LUMION".	
Prerequisite (s)	As Advised	
Textbook	Stefan Mordue et al., *Building Information Modeling for Dummies*, John Wiley & Sons Ltd. 2016	
Lab./Computer Work/Project	Emphasis on: "**BIM Digital Tools**"	

ARC281	Buildings' Laws & Regulations	2 CH (1,2,0)
Course Contents	The course explains the building codes, laws, and regulations of the Construction industry in Egypt. It is a study of the codes and legislations in terms of bylaws, regulations, and scope of services. Types of contracts, fees, and bidding are the main issues of this course. Case studies of real sites are examined, discussed, and analyzed.	
Prerequisite (s)	None	

Textbook	*Building Law No.119 Est. 2008 قانون البناء الموحد لسنة 2008 ولائحته التنفيذية * Egyptian Code for design principals and construction conditions for buildings fire protection (Part 1)
Lab./Computer Work/Project	Emphasis on: "**Local Buildings' Laws & Regulations**"

ARC312	Interior Design (1) - Residential and Tourism	4 CH (1,5,0)
Course Contents	Requirements of residential and tourism buildings, in addition to Human Factors issues including ergonomics, and human behavior are the core of this design studio. Domestic interior design and medium-scale projects are delivered with an emphasis on detailed drawings and visualization techniques.	
Prerequisite (s)	ARC213	
Textbook	DeChiara, Joseph; Panero, Julius; Zelnik, Martin, 2001: *Time-Saver Standards for Interior Design and Space Planning.* McGraw-Hill; 2nd Edition –OR- the most recent metric version	
Lab./Computer Work/Project	Emphasis on: "**Residential & Touristic – Domestic Interiors**"	

ARC315	Architectural Design (3)	4 CH (1,6,0)
Course Contents	This course emphasizes the practical application of local building laws and regulations in architectural design. Students will engage with zoning codes, building height restrictions, and safety standards to develop comprehensive projects. The main project may involve designing a multi-story departmental flat with at least 6 units per floor and a total of 10 to 12 floors or a complex building. The course will challenge students to navigate regulatory frameworks while maintaining creativity and functionality. Projects may align with local competitions, encouraging students to present their designs in a competitive setting.	
Prerequisite (s)	ARC213 & ARC281	
Textbook	Neufert, E.: *Architects' Data; The Handbook of Building Types,* Third Edition, Blackwell Publishing, 2002, The Alden Group Ltd., Oxford & Northampton, metric edition. Charleson; Andrew: Structure as Architecture: A Source Book for Architects and Structural Engineers 2nd Edition. Environmental Design; An introduction for architects and engineers – 3rd edition – by Randall Thomas.	
Lab./Computer Work/Project	Emphasis on: "**Practical Application of Local Building Laws and Regulations**"	

ARC316	Architectural Design (4)	4 CH (1,6,0)
Course Contents	This course explores Futuristic Architecture, challenging students to envision the future of design. It delves into concepts like Hyper Architecture, Vertical Cities, Biomimicry, and Responsive Architecture. Using Virtual Reality (VR) and Extended Reality (XR), students will immerse themselves in designing projects such as Virtual Museums or Intelligent Responsive Houses, enabling interactive visualization. Projects may also be submitted to relevant design competitions.	
Prerequisite (s)	ARC213	
Textbook	Kushner; Marc.: *The Future of Architecture in 100 Buildings,* Simon & Schuster UK, 2015	
Lab./Computer Work/Project	Emphasis on: "**Futuristic Architecture**"	

ARC322	History & Theories of Interior Design	2 CH (1,2,0)
Course Contents	This course examines the evolution of interior and furniture design from the Renaissance to modernity, focusing on how materials and construction systems have shaped practices across different historical periods. Additionally, students will explore contemporary movements in interior design, analyzing their local and international impacts. This dual focus provides a comprehensive understanding of the historical and contemporary influences on design.	
Prerequisite (s)	As Advised	
Textbook	**Recommended Readings:** **Instructor's lecture notes and Handouts related to chosen eras and case studies.**	
Lab./Computer	--	

ARC326	History & Theories of Architecture (3)	2 CH (2,0,0)
Course Contents	An introduction to the theories and philosophies of the International Style of the 20th Century and the Modern Movement. The course traces the development of architectural thought in the 2nd half of the 20th Century until the present. Also an introduction to design standards, concepts, and considerations of office buildings, cultural and civic centers, health facilities, educational buildings, Transportation buildings, and tourist facilities.	
Prerequisite (s)	As Advised	
Textbook	Charles Jenks: *The story of Post Modernism: Five Decades of the Ironic, Iconic and Critical in Architecture*, 2011, John Wiley & Sons, United Kingdom.	
Lab./Computer	--	

ARC332	Computer Applications	2 CH (1,0,2)
Course Contents	This elective course introduces students to the use of *Rhinoceros (Rhino)* and *Grasshopper* software in architectural design. It emphasizes parametric modeling, enabling students to develop complex forms and explore dynamic workflows. Participants will learn to create 3D models, automate design processes, and integrate digital tools into design thinking. The course also covers essential techniques for organizing projects through layers and generating visual presentations, enhancing both technical precision and creativity in architecture.	
Prerequisite (s)	EED161	
Textbook	Michael Brightman: The SketchUp Workflow for Architecture: Modeling Buildings, Visualizing Design, and Creating Construction Documents with SketchUp Pro and Layout. John Wiley & Sons, 2013	
Lab./Computer Work/Project	Emphasis on: "**Parametric Digital Tools**"	

ARC347	Building Construction & Materials (3)	4 CH (1,6,0)
Course Contents	This course explores advanced construction systems for large-span and high-rise buildings, incorporating immersive virtual reality simulations for hands-on learning. Students will learn\ contemporary construction techniques, including partitions and curtain walls, and the application of various finishing materials such as brick, timber, and metals. The course further addresses thermal and damp proofing, expansion joints, flooring techniques, internal and external cladding, and elevation structure, enhanced by virtual relaity tools for detailed virtual walkthroughs and performance analysis.	
Prerequisite (s)	ARC243	
Textbook	Angel, Heino, *Structural Systems*, 3rd edition, 2007, Chudley, Roy & Greeno, Roger: Building Construction Handbook, 10th Ed, Routledge, NY, 2014	

Lab./Computer Work/Project	Emphasis on: "**Building Construction & Materials drawings**"

ARC352	**Urban Planning**	**3 CH (2,2,0)**
Course Contents	This course covers urban and city planning history, defining various urban fabrics and city components. It details strategic urban planning methodology, including surveys, problem analysis, and master plan creation for new and existing cities. The curriculum also addresses approaches for deteriorated and informal areas. Students apply these concepts in a practical project, typically an urban upgrading process for a selected city district.	
Prerequisite (s)	As Advised	
Textbook	Weber, R. and Randal, C, *The Oxford handbook of Urban Planning*, Oxford, 2015.	
Lab./Computer Work/Project	Emphasis on: "**Urban and City Planning**"	

ARC355	**Urban Design & Housing**	**4 CH (2,4,0)**
Course Contents	This course explores urban design, housing, and the evolution of urban form, emphasizing contextual design principles and site planning. Students will engage with virtual reality for immersive spatial modeling, enabling real-time design iteration and experiential evaluation of scale, density, and circulation with spatial evaluation. The curriculum covers design processes, elements, and applications, supported by local and international case studies.	
Prerequisite (s)	As Advised	
Textbook	-Matthew Carmona, Tim Heath, Taner Oc, Steve Tiesdell, *Public Places - Urban Spaces: The Dimensions of Urban Design*, Boston: Architectural Press, (2003). -Kevin Lynch: *The Image of the City*, MIT, 1960	
Lab./Computer Work/Project	Emphasis on: "**Urban Design & Housing**"	

ARC361	**Interior Design with Light and Sound**	**3 CH (1,4,0)**
Course Contents	The course develops the students' basic understanding of "room acoustics", and how to choose and use suitable sound systems in specific interiors requiring specific functions. Also, students learn how to choose and use the suitable light system for different interiors with different functional requirements. Students also learn how to design suitable acoustic and lighting systems for special functional interiors.	
Prerequisite (s)	As Advised	
Textbook	John E. Flynn, Jack A. Kremers, Gary Steffy, 1992: *Architectural Interior Systems: Lighting, Acoustics, Air Conditioning.* Van Nostrand Reinhold.	
Lab./Computer Work/Project	Emphasis on: "**Interior Acoustics & Lighting Systems**"	

ARC362	**Environmental Control, Acoustics, lighting systems and Technical Installations**	**3 CH (1,4,0)**
Course Contents	This course provides a comprehensive understanding of environmental systems within architectural engineering, addressing topics such as environmental definitions, energy and thermal dynamics for thermal comfort, heat transfer and insulation, HVAC and hydraulic services, life safety and both natural and artificial lighting. The curriculum explores acoustics, in terms of sound analysis and noise control. Virtual Reality simulations will be incorporated to provide immersive experiences for the analysis of environmental performance, visualization of system designs, and optimization of building comfort and efficiency.	

Prerequisite (s)	None
Textbook	* Bauer, Michael, Peter Mösle, and Michael Schwarz. *Green building: guidebook for sustainable architecture*. Springer Science & Business Media, 2009. * Descottes, Hervé, and Cecilia E. Ramos. *Architectural lighting: designing with light and space*. Princeton Architectural Press, 2013.
Lab./Computer Work/Project	Emphasis on: "**Environmental Control & Technical Installations**"

ARC372	**Interior Design Execution (1)**	**3 CH (1,4,0)**
Course Contents	The course develops the student's knowledge and skills of producing working and executing drawings of interior design spaces; in plans, sections, sectional elevations, and internal wall elevations, with full labels, dimensions, levels, and material finishing.	
Prerequisite (s)	ARC243	
Textbook	Slitt; Fred. Working Drawing manual, 1998, McGraw Hill	
Lab./Computer Work/Project	Emphasis on: "**Interior Design Execution Drawings**"	

ARC374	**Execution Design**	**4 CH (2,4,0)**
Course Contents	The course addresses the basics of drafting working drawings. Students will learn how to deal with dimensioning and coding systems. They will also practice coordination between architectural, structural, and electromechanical needs. Their practice will be on a small to medium-scale project.	
Prerequisite (s)	ARC243	
Textbook	Fred Slitt: *Working Drawing manual*, 1998, McGraw Hill	
Lab./Computer Work/Project	Emphasis on: "**Basics of Drafting Working Drawings**"	

ARC375	**Furniture Design**	**3 CH (1,4,0)**
Course Contents	This course explores furniture design by focusing on ergonomic, scientific, and functional aspects. Students will engage in sketching, drawing, model making, and testing to understand the relationship between form and function in modern furniture. Additionally, the course covers the details of furniture production, teaching students to develop material lists, create technical drawings, and apply the manufacturing and finishing processes. This combined approach equips students with both design and practical skills, preparing them for the complexities of the furniture industry.	
Prerequisite (s)	As Advised	
Textbook	Jim Postell, 2012: *Furniture Design 2nd Edition*. Wiley	
Lab./Computer Work/Project	Emphasis on: "**Furniture Design**"	

ARC376	**Interior Design Styles and Trends**	**2 CH (1,2,0)**
Course Contents	The course aims to study the theories of different interior design Oriental schools, styles, and trends, and how they influence contemporary interiors. Students address different characteristics of these schools; and discuss their philosophies and influences through group discussions in the classroom.	
Prerequisite (s)	As advised	

Textbook	Same textbook for INT 431 + Instructor's Lecture Notes and Handouts.
Lab./Computer Work/Project	Emphasis on: "**Interior Design Styles and Trends**"

ARC411	**Architectural Design (5)**	**4 CH (1,6,0)**
Course Contents	This course explores environmental design and sustainable architecture, emphasizing energy efficiency, renewable resources, and minimal impact construction. Students will be tasked with designing buildings such as: green schools, eco-friendly university campuses, which will required to integrate sustainable materials, passive design principles, and site-responsive strategies. The design process will apply virtual reality to create prototypes for the students to visually navigate their concepts and intuitively understand the efficacy of sustainable solutions. The aim is to reduce carbon footprints and promote the development of healthy learning environments through the submission of proposals to design competitions.	
Prerequisite (s)	ARC213	
Textbook	Reid Ewing and Otto Clemente: *Measuring Urban Design Metrics for Livable Places*, Island Press, 2000 M St. NW Suite 650, Washington, 2013	
Lab./Computer Work/Project	Emphasis on: ***environmental design principles and sustainable architectural practices"***	

ARC413	**Interior Design (2) - Business, Corporate & Retail**	**4 CH (1,5,0)**
Course Contents	This course explores the interior design of retail and commercial buildings, focusing on three-dimensional spatial development in large, complex institutional projects. Students will integrate concepts, construction, and materials to create functional and aesthetic environments. Case studies will analyze design strategies, construction techniques, and material choices in various retail and commercial settings. The course also examines the unique challenges of designing large-scale projects like office buildings and business parks.	
Prerequisite (s)	ARC213	
Textbook	Drew Plunkett, Olga Reid, 2012: *Detail in Contemporary Retail Design*. Laurence King Publishing, Har/Cdr edition	
Lab./Computer Work/Project	Emphasis on: "**Business, Corporate & Retail**"	

ARC472	**Building Technology (1)**	**3 CH (2,2,0)**
Course Contents	The course focuses on detailing the execution and construction issues. Sketches and diagrams are needed to clarify all main stages of design and execution details. Students are required to research and investigate the different roles of material in design. In addition, students will learn how to write technical specifications of building/construction items. Their practice will be on a medium-scale project.	
Prerequisite (s)	ARC243	
Textbook	Edward Allen, Joseph Iano: *Fundamentals of Building Construction: Materials and Methods*, 5th Edition	
Lab./Computer Work/Project	Emphasis on: "**Detailing the Execution and Construction**"	

ARC473	**Building Technology (2)**	**3 CH (2,2,0)**
Course Contents	The course focuses on the preparation of complementary execution documents for projects, including Quantity surveying, Analysis of bids, Cost analysis, and Shop and as-built drawings. The practice will be on a medium-scale complex project.	

Prerequisite (s)	ARC374 or ARC472
Textbook	Slitt; Fred. *Working Drawing manual*, 1998, McGraw Hill
Lab./Computer Work/Project	Emphasis on: "**BOQ, Shop, and As-Built Drawings**"

ARC474	**Interior Design Execution (2)**	**4 CH (2,4,0)**
Course Contents	The course develops the student's knowledge and skills in producing working and executing drawings of interior design details; in plans, sections, fixations, and joints for different building elements; different types of floors, walls, ceilings, and fixed furniture.	
Prerequisite (s)	ARC243	
Textbook	Rosemary Kilmer, W. Otie Kilmer, 2016: *Construction Drawings and Details for Interiors 3rd Edition*. Wiley.	
Lab./Computer Work/Project	Emphasis on: "**Interior Design Execution**"	

ARC475	**Interior Specs & BOQs**	**2 CH (1,2,0)**
Course Contents	After finishing this course, the student should be able to produce complete working and execution drawings and documents for an interior design project. In addition to the full package of drawings, students can submit a full list of specifications for all materials used in their interior design project, in addition to the Bills of quantities for all materials used. Also, students get acquainted with the contract elements, knowing their rights and duties towards their clients.	
Prerequisite (s)	ARC372 or ARC474	
Textbook	Instructor's lecture notes and Handouts.	
Lab./Computer Work/Project	Emphasis on: "**Interior Specs & BOQs**"	

ARC491	**Graduation Project Studies**	**2 CH (1,2,0)**
Course Contents	The graduation project studies course in the Interior Design and Architectural Engineering program prepares students to tackle real-world design challenges. Throughout the course, students conduct research within a thesis that guides the selection of the project program and site. This process involves formulating design criteria, conducting site analysis, collecting data, and developing the project program. As a capstone course, it integrates knowledge from previous coursework, culminating in a project that addresses both interior and architectural aspects, preparing students for professional practice.	
Prerequisite (s)	Student must have successfully completed 116 CH	
Textbook	Pena, W., Parshall, S. and Kelly, K., *Problem Seeking; An Architectural Programming Primer*, AIA Press, Washington, USA.	
Lab./Computer Work/Project	Emphasis on: ***"Graduation Project Thesis"***	

ARC492	**Graduation Project**	**5 CH (1,7,0)**
Course Contents	The graduation project course challenges students to solve complex, real-world design problems by integrating the skills and knowledge gained during their studies. It emphasizes developing both interior and architectural solutions, from concept to detailed design. Students will apply advanced analytical methods, conduct site assessments, and formulate programs to meet the project's objectives at various scales, demonstrating their readiness for professional practice through a comprehensive and cohesive design outcome.	

Prerequisite (s)	ARC491
Textbook	Recommended Readings: a) Neufert, Architects' Data. b) Time Saver Standards, Handbook. c) Architectural Magazines and Projects. Internet Resources that highlight design concepts of complex projects.
Lab./Computer Work/Project	Emphasis on: ***"Graduation Project"***

ARC311	**Special Topics in Furniture Design (Course Type B)**	**2 CH (1,2,0)**
Course Contents	This course offers an in-depth exploration of current and emerging issues in furniture design. Topics may vary but often include innovative materials, sustainability, cultural influences, and advanced design techniques. Students will engage with specialized themes through research, discussion, and hands-on projects, gaining insight into how these factors shape the future of furniture design. The course encourages creative problem-solving and critical thinking, preparing students to tackle complex design challenges in professional settings.	
Prerequisite (s)	As advised	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. Savage, D. (2011). Furniture with soul: Master woodworkers and their craft. Kodansha USA Incorporated. https://books.google.com.eg/books/about/Furniture_with_Soul.html?id=7aBNEAAAQBAJ&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**Special topics in furniture design**"	

ARC412	**Visual Image Design (Course Type A)**	**3 CH (1,4,0)**
Course Contents	This course investigates the evolving identity of cities in response to contemporary cultural, technological, and social shifts. Through analysis of urban imagery, design trends, and architectural innovation, students will examine how cities adapt their visual and spatial narratives. Emphasis is placed on critical evaluation of urban form, public spaces, and community identity, with projects focused on reimagining cityscapes for the modern era. Students will gain insights into shaping cities that resonate with today's dynamic urban life.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. **"The Image of the City"** by *Kevin Lynch* 3. **"The Endless City: The Urban Age Project by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society"** by *Ricky Burdett and Deyan Sudjic* The Endless City: The Urban Age Project by the London School of Economics ... - London School of Economics and Political Science - Google Books	
Lab./Computer Work/Project	Emphasis on: "**Visual Image Design**"	

ARC415	**Residential and Hospitality Interior Design (Course Type A)**	**3 CH (1,4,0)**
Course Contents	The course aims to study the theories of different interior design Oriental schools, styles, and trends, and how they influence contemporary interiors. Students address different characteristics of these schools; and discuss their philosophies and influences through group discussions in the classroom.	
Prerequisite (s)	--	

Textbook	Same textbook for INT 431 + Instructor's Lecture Notes and Handouts.
Lab./Computer Work/Project	Emphasis on: "**Residential and Hospitality Interior Design**"

ARC414	**Applied Project in Interior Design**	**5 CH (1,7,0)**
Course Contents	This course provides a comprehensive framework for students to undertake a full-scale interior design project from concept to execution. Participants will develop skills in project management, spatial planning, and client interaction while applying theoretical knowledge to real-world scenarios. Through collaborative work, students will create design proposals that reflect current trends and address practical needs. The course emphasizes critical thinking, problem-solving, and presentation skills, preparing students to effectively communicate their design visions and implement successful interior environments.	
Prerequisite (s)	As advised	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. James A. Dunnett (2015), Designing Interior Architecture: Concept, Technique, and Craft. 3. Sara E. McFadden (2019), Creative Projects for the Interior Design Student.	
Lab./Computer Work/Project	Emphasis on: "**Interior Design**"	

ARC321	**Furniture designers and brands (Course Type B)**	**2 CH (1,2,0)**
Course Contents	The course explores the world of furniture design, focusing on the creative processes and business strategies behind leading designers and brands. Students will study the evolution of design, market trends, and the impact of cultural and technological shifts on the industry. Through case studies and hands-on projects, they will analyze how iconic brands have shaped contemporary furniture design and apply these insights to their work, preparing for careers in design or brand management.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Pourny, C. (2014). The furniture bible: Everything you need to know to identify, restore & care for furniture. Hachette UK. https://books.google.com.eg/books/about/The_Furniture_Bible.html?id=LWRiBAAAQBAJ&redir_esc=y 3. Heller, S., & Ilic, M. (2009). Anatomy of Design: Uncovering the Influences and Inspiration in modern graphic design. Rockport Publishers. https://books.google.com.eg/books/about/Anatomy_of_Design.html?id=sHhFnOXqy9gC&redir_esc=y 4. Postell, J. (2012). Furniture design. John Wiley & Sons. https://books.google.com.eg/books/about/Furniture_Design.html?id=kBG-hNk4s34C&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**Furniture designers and brands**"	

ARC324	**Furniture mockups (Colors & Materials) (Course Type B)**	**2 CH (1,2,0)**
Course Contents	The course delves into the art of creating furniture mockups, with a focus on color schemes and material selection. Students will explore techniques for visualizing furniture designs and experimenting with a range of materials and finishes to understand their impact on aesthetics and functionality. Through practical projects, they will learn to communicate design ideas effectively, making informed choices that enhance both form and usability, preparing them for professional roles in furniture design and production.	
Prerequisite (s)	--	

Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Lawson, S. (2013). Furniture design: An introduction to development, materials, manufacturing. Hachette UK. https://books.google.com.eg/books/about/Furniture_Design.html?id=c_UgEAAAQBAJ&redir_esc=y 3. Ashby, M. F., & Johnson, K. (2002). Materials and design: The art and science of material selection in product design. Butterworth-Heinemann. https://www.sciencedirect.com/book/9780080982052/materials-and-design
Lab./Computer Work/Project	Emphasis on: "**Furniture mockups (colors & materials)**"

ARC323	**Upgrading & Conservation (Course Type B)**	**2 CH (1,2,0)**
Course Contents	This course explores strategies for revitalizing and preserving urban areas, focusing on sustainable methods to enhance city living while honoring cultural heritage. Students will analyze real-world case studies, learn adaptive reuse principles, and engage in community-centered design practices. Emphasis is placed on understanding historical contexts, balancing development with conservation, and proposing innovative solutions for aging urban spaces. Through project-based learning, students gain practical experience in transforming cities into resilient, livable environments that respect their architectural legacy.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. **Heritage, Conservation, and Communities: Engagement, Participation and Capacity Building"** by *Gill Chitty* Heritage, Conservation and Communities: Engagement, participation and ... - Google Books	
Lab./Computer Work/Project	Emphasis on: "**Upgrading & Conservation**"	

ARC424	**Affordable Housing and Community Development (Course Type A)**	**3 CH (1,4,0)**
Course Contents	This course examines the design and development of affordable housing within diverse communities, emphasizing practical solutions that address social, economic, and environmental needs. Students will explore policy frameworks, financing options, and community engagement techniques essential to sustainable housing projects. Through case studies and hands-on projects, the course emphasizes strategies for creating inclusive, resilient neighborhoods that enhance quality of life and promote social equity, preparing students to tackle real-world challenges in housing and urban planning.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. **"Affordable Housing in New York: The People, Places, and Policies That Transformed a City"** by *Nicholas Dagen Bloom, Matthew Gordon Lasner*	
Lab./Computer Work/Project	Emphasis on: "**Affordable Housing and Community Development**"	

ARC325	**Special Topics in Urban Design (Course Type B)**	**2 CH (1,2,0)**
Course Contents	This course delves into emerging issues and advanced concepts in urban design, examining topics such as smart cities, climate-resilient planning, and urban mobility innovations. Students engage with contemporary challenges shaping city development, analyzing case studies, and exploring interdisciplinary approaches to urban spaces. Through research and hands-on projects, students develop critical thinking and design skills to address complex urban issues, equipping them to contribute meaningfully to the future of sustainable and	

	inclusive city environments.
Prerequisite (s)	As advised
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. **"The Social Logic of Space"** by *Bill Hillier and Julienne Hanson* 3. **"Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia"** by *Anthony M. Townsend*
Lab./Computer Work/Project	Emphasis on: "**Special Topics in Urban Design**"

ARC426	Smart Cities and the Future of Transport Systems (Course Type B)	2 CH (1,2,0)
Course Contents	This course introduces the increase in mobility and car ownership over the years has resulted in several problems including an increase in congestion, pollution, energy consumption, and traffic accidents. At the same time, unprecedented urbanization compels cities to fundamentally reinvent themselves for the future. Throughout the years, several solutions have been proposed, with the one of smart cities gaining ground over the last years.	
Prerequisite (s)	As advised	
Textbook	D. Luo (2019). Changing Roles of planners in smart neighbourhood practice: A case study of Sidewalk Toronto Project. MSc Thesis, Columbia University.-	
Lab./Computer Work/Project	Emphasis on: "**Smart Cities and Future of Transport Systems**"	

ARC327	Special Topics in Sustainable Urban Mobility Planning (Course Type B)	2 CH (1,2,0)
Course Contents	This course delves into emerging issues in sustainable mobility, addressing innovative frameworks such as integrated multimodal networks, mobility-as-a-service (MaaS), and adaptive reuse of infrastructure. Students will examine case studies and explore tools for promoting equity, accessibility, and reduced carbon footprints through thoughtful design and policy integration. A focus will be placed on collaborative planning strategies involving stakeholders, along with advanced urban analytics for decision-making.	
Prerequisite (s)	As advised	
Textbook	1. Smart Energy for Smart Transport Smart Energy for Smart Transport: Proceedings of the 6th Conference on Sustainable Urban Mobility, CSUM2022, August 31-September 2, 2022, Skiathos Island, Greece | SpringerLink	
Lab./Computer Work/Project	Emphasis on: "**Special Topics in Sustainable Urban Mobility Planning**"	

ARC328	Histories of Landscape Architecture (Course Type B)	2 CH (1,2,0)
Course Contents	It's into the evolution of landscape design from ancient to modern times. Students will investigate key movements, influential figures, and transformative projects that have shaped outdoor spaces throughout history. Through a blend of lectures, discussions, and field studies, participants will uncover the cultural, social, and environmental contexts that inform landscape architecture. This course emphasizes critical thinking and encourages students to analyze how historical narratives continue to influence contemporary practices in the field.	
Prerequisite (s)	--	
Textbook	1. Treib, M. (1994). Modern landscape architecture: A critical review. MIT Press. (https://books.google.com.eg/books/about/Modern_Landscape_Architecture.html?id=90wDdamk34IC&redir_esc=y) 2. Rogers, E. B. (2001). Landscape design: A cultural and architectural history. (https://books.google.com.eg/books/about/Landscape_Design.html?id=-KK_oAEACAAJ&redir_esc=y)	

	3. Hunt, J. D. (1992). Gardens and the picturesque: Studies in the history of landscape architecture. MIT Press. (https://books.google.com.eg/books/about/Gardens_and_the_Picturesque.html?id=nGH16blAkggC&redir_esc=y)
Lab./Computer work/Project	Emphasis on: "**Histories of Landscape Architecture**"

ARC429	**Healing Landscape (Course Type A)**	**3 CH (1,4,0)**
Course Contents	This course explores the design and implementation of landscapes that promote physical, mental, and emotional well-being. Students will delve into the principles of therapeutic landscape design, examining how natural and built environments can support healing processes in various settings, such as healthcare facilities, public parks, and urban spaces. Through case studies, theoretical frameworks, and practical design exercises, the course will emphasize creating inclusive, sustainable, and culturally sensitive healing environments.	
Prerequisite (s)	--	
Textbook	Marcus, C.; Sachs, N. (2013). Therapeutic Landscapes: An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces. Wiley.	
Lab./Computer work/Project	Emphasis on: "**Healing Landscape**"	

ARC431	**Visualizing Furniture: Design & Drawings (Course Type A)**	**3 CH (1,4,0)**
Course Contents	The course focuses on the techniques used to visually represent furniture designs through detailed drawings and renderings. Students will learn to translate concepts into clear, accurate visual formats, exploring both traditional hand-drawing methods and digital tools. Emphasis is placed on developing technical drawing skills, spatial awareness, and the ability to convey design intentions effectively. Through practical exercises, students will refine their ability to create professional visual presentations of furniture designs.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Plunkett, D. (2009). Drawing for interior design. Hachette UK. https://books.google.com.eg/books/about/Drawing_for_Interior_Design_Second_Editi.html?id=360gEAAAQBAJ&redir_esc=y 3. Postell, J. (2012). Furniture design. John Wiley & Sons. https://books.google.com.eg/books/about/Furniture_Design.html?id=kBG-hNk4s34C&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: " **Visualizing Furniture: Design & Drawings** "	

ARC432	**Digital Fabrication for Furniture Design (Course Type B)**	**2 CH (1,2,0)**
Course Contents	The "Digital Fabrication for Furniture Design" course introduces students to contemporary techniques in design and production using advanced tools such as laser cutters, 3D printers, and CNC machines. Emphasizing parametric design and hands-on learning, the course guides students through the process of conceptualizing and fabricating furniture pieces. By integrating digital modeling software with fabrication technologies, students explore creative solutions, bridging design intent with material constraints and practical execution, fostering innovative approaches in furniture design.	
Prerequisite (s)	--	
Textbook	Anderson, J. (2021). Digital Fabrication in Interior Design: Body, Object, Enclosure, Routledge.	

Lab./Computer Work/Project	Emphasis on: "**Digital Fabrication for Furniture Design**"

ARC433	**BIM & 4D Simulation (Course Type A)**	**3 CH (1,4,0)**
Course Contents	This course explores the integration of Building Information Modeling (BIM) with time-based scheduling to enhance project visualization and management. Students will learn to create dynamic 4D simulations that illustrate the construction process, improving communication among stakeholders and facilitating efficient decision-making. Through hands-on projects, participants will develop skills in software tools and techniques, preparing them for real-world applications in architecture, engineering, and construction.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Eastman, C. M. (2008). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers, and contractors. John Wiley & Sons. https://books.google.com.eg/books/about/BIM_Handbook.html?id=-GjrBgAAQBAJ&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**BIM & 4D Simulation**"	

ARC434	**Innovative 3D Printing Applications (Course Type A)**	**3 CH (1,4,0)**
Course Contents	This course delves into cutting-edge techniques and materials in 3D printing relevant to architecture and design. Students will explore the transformative potential of additive manufacturing, focusing on its applications in creating complex structures, prototypes, and customized components. The course emphasizes hands-on experience with various printing technologies, enabling participants to understand the design implications and sustainability aspects of 3D printing. By the end, students will be equipped to integrate these innovations into their architectural practices.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Gibson, I., Rosen, D., & Stucker, B. (2014). Additive manufacturing technologies: 3D printing, rapid prototyping, and direct digital manufacturing. Springer. https://books.google.com.eg/books/about/Additive_Manufacturing_Technologies.html?id=OPGbBQAAQBAJ&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**Innovative 3D printing Applications**"	

ARC335	**Virtual Augmented Reality & Artificial Intelligence (Course Type B)**	**2 CH (1,2,0)**
Course Contents	This course examines the intersection of immersive technologies and intelligent systems in architectural design. Students will explore how virtual and augmented reality can enhance spatial understanding and client engagement, while AI tools streamline design processes and improve project outcomes. Through practical projects, participants will develop skills in creating interactive environments and utilizing AI-driven insights, preparing them to harness these advanced technologies for innovative architectural solutions in real-world applications.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. Arnaldi, B., Guitton, P., & Moreau, G. (2018). Virtual reality and augmented reality: Myths and realities. John Wiley & Sons. https://books.google.com.eg/books/about/Virtual_Reality_and_Augmented_Reality.html?id=fftUDwAAQBAJ&redir_esc=y	

Lab./Computer Work/Project	Emphasis on: " Virtual Augmented Reality & Artificial Intelligence"

ARC436	Geographic Information System (GIS) (Course Type A)	3 CH (1,4,0)
Course Contents	The "Geographic Information System (GIS)" course for an Architectural Design Department focuses on equipping students with skills to analyze, visualize, and manage spatial data. Through GIS tools and methodologies, students explore how geospatial technologies support urban design, planning, and architecture. The course emphasizes hands-on applications, including spatial analysis, mapping, and the integration of GIS into design workflows to solve real-world urban challenges, fostering a deeper understanding of spatial relationships in the built environment.	
Prerequisite (s)	--	
Textbook	1. **Longley, P., Goodchild, M. F., Maguire, D. J., & Rhind, D. W.** (2015). *Geographic Information Science and Systems* (4th ed.) 2. **Wright, D. J., & Harder, C.** (2020). *GIS for Science, Volume 2: Applying Mapping and Spatial Analytics*. Esri Press.	
Lab./Computer Work/Project	Emphasis on: "**Geographic Information System (GIS)**"	

ARC337	Introduction to Building Information Modelling (BIM) and Geographic Information Systems (GIS) (Course Type B)	2 CH (1,2,0)
Course Contents	This course introduces the fundamentals of BIM and GIS, their integration, and applications in architectural design and project planning. Students will explore how BIM documents can be georeferenced, enabling them to visualize and manage building information within a geographic context. Key Topics covered in this course: Basics of BIM and ArcGIS GeoBIM, georeferencing in ArcGIS GeoBIM, spatial data management, and cross-disciplinary data integration.	
Prerequisite (s)	--	
Textbook	Wallis, P.; Gruber, B. (2019). The smart workplace: Indoor GIS for Smart Buildings. esri.	
Lab./Computer work/Project	Emphasis on: "**Introduction to Building Information Modelling (BIM) and Geographic Information Systems (GIS)**"	

ARC338	Digital Twin Applications in Architecture and Urbanism using GIS and BIM [GeoBIM] (Course Type B)	2 CH (1,0,2)
Course Contents	This course explores digital twins in the built environment, utilizing GeoBIM technologies. Digital twins are dynamic virtual models integrating real-time data for analysis and decision-making. Students will learn how GIS and BIM converge to create these twins, applying them to urban planning, infrastructure, and sustainability. Through hands-on exercises, students will design, build, and analyze digital twins, addressing challenges like smart city management and environmental resilience.	
Prerequisite (s)	--	
Textbook	- Esri (2019). Digital Twin. Esri. -Esri (2019). Building Smart Infrastructure in a Digital Age: Global Innovators. Esri. - Esri (2019). Contextual Intelligence How Location Technology Overcomes Complexity. Esri. -ESRi (2019). Operational Intelligence: Location Provides a Common Language to Drive Efficiency. Esri.	
Lab./Computer work/Project	Emphasis on: "**Special topics in GIS & BIM**"	

ARC439	Special Topics in GIS & BIM (Course Type B)	2 CH (1,0,2)
Course Contents	This course delves into advanced GIS and BIM, focusing on their integration and application in architecture, urban planning, and sustainable development. Through lectures, hands-on exercises, and case studies, students will master advanced digital tools and methodologies to address complex built environment challenges. Topics may include Smart Cities, Infrastructure Management, and Heritage Conservation, all emphasizing interdisciplinary collaboration and innovative problem-solving.	
Prerequisite (s)	--	
Textbook	- Esri (2019). Building Smart Infrastructure in a Digital Age: Global Innovators. Esri. - Esri (2019). Contextual Intelligence How Location Technology Overcomes Complexity. Esri. - ESRi (2019). Operational Intelligence: Location Provides a Common Language to Drive Efficiency. Esri.	
Lab./Computer work/Project	Emphasis on: "**Special topics in GIS & BIM**"	

ARC441	Built-in Cabinet, Lighting & Styling (Course Type A)	3 CH (1,4,0)
Course Contents	The course covers the design and integration of built-in cabinets, lighting, and styling in interior spaces. Students will explore the functional and aesthetic roles of cabinetry, along with the impact of lighting on mood and design. The course emphasizes the harmony between storage solutions, lighting techniques, and decorative styling to create cohesive interiors. Practical projects will enable students to design and style built-ins with attention to detail, enhancing both form and function in their spaces.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. HOME, E. O. F. (2018). Built-Ins cabinets and shelves. Taunton Press. https://books.google.com.eg/books/about/Built_Ins_Cabinets_and_Shelves.html?id=vhGVswEACAAJ&redir_esc=y Innes, M. (2012). Lighting for interior design. Hachette UK. https://books.google.com.eg/books/about/Lighting_for_Interior_Design.html?id=H_UgEAAAQBAJ&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**Built in cabinet, lighting & styling**"	

ARC342	Sustainable Technology (Course Type B)	2 CH (1,2,0)
Course Contents	This course examines the integration of eco-friendly technologies in design and construction. The course focuses on tools and systems that promote energy efficiency, waste reduction, and resource conservation. Students will explore renewable energy systems, smart materials, and advanced building techniques that support sustainable development. Through practical applications and theoretical insights, the course equips students with the skills to implement innovative technologies that enhance environmental performance in buildings and infrastructure while reducing their ecological impact.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Kibert, C. J. (2008). Sustainable construction: Green building design and delivery. John Wiley & Sons. https://books.google.com.eg/books/about/Sustainable_Construction.html?id=2xgWCgAAQBAJ&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**Sustainable Technologies**"	

ARC443	Prefabrication & Modular Construction (Course Type A)	3 CH (1,4,0)
Course Contents	This course explores innovative building methods that emphasize efficiency, flexibility, and sustainability. The course focuses on the principles of prefabrication, modular design, and off-site construction techniques that streamline the building process. Students will learn how to design and assemble modular components, considering structural integrity, material use, and environmental impact. The course highlights the benefits of these approaches, such as reduced construction time, waste minimization, and adaptability, while addressing challenges in design integration and implementation.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Smith, R. E. (2011). Prefab architecture: A guide to modular design and construction. John Wiley & Sons. https://books.google.com.eg/books/about/Prefab_Architecture.html?id=NZOL4TKggo8C&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**Refabrication & Modular Construction**"	

ARC444	Special Topics in Construction Technology (Course Type B)	2 CH (1,2,0)
Course Contents	This course investigates emerging trends and techniques that are reshaping the construction industry. Students will explore advanced materials, innovative building methods, and the integration of digital tools to enhance project efficiency and sustainability. Through case studies and hands-on projects, participants will gain insights into topics such as smart construction, prefabrication, and construction automation. This course equips future professionals with the knowledge and skills needed to adapt to the rapidly evolving landscape of construction technology.	
Prerequisite (s)	As advised	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Advanced Construction Technology" by Roy Chudley and Roger Greeno Advanced Construction Technology - Roy Chudley, Roger Greeno - Google Books	
Lab./Computer Work/Project	Emphasis on: "**Special Topics in Construction Technology**"	

ARC445	Landscape Construction Design (Course Type A)	3 CH (1,4,0)
Course Contents	It focuses on the principles and techniques of creating functional outdoor spaces. Students will explore the integration of design concepts with construction methodologies, covering materials, planting strategies, and site planning. The course emphasizes hands-on projects, where participants will develop skills in drafting plans, selecting appropriate materials, and understanding site dynamics. Through practical applications and collaborative projects, students will learn how to effectively translate design ideas into well-structured and sustainable landscape environments.	
Prerequisite (s)	--	
Textbook	1. Sauter, D. (2000). Landscape construction. Delmar Pub. (https://books.google.com.eg/books/about/Landscape_Construction.html?id=TVEIAAAAQBAJ&redir_esc=y)	
Lab./Computer Work/Project	Emphasis on: "**Landscape Construction Design**"	

ARCx49	Building Construction (Elective)	3 CH (2,2,0)

Course Contents	Building construction techniques: phases of buildings construction, wall bearing construction, skeleton construction (RC, Steel), Wall techniques: stone and brick, architectural finishing techniques: arches, design of stairs cases, floorings and plastering, Water and heat proofing techniques, Architectural drawings and symbols techniques.
Prerequisite (s)	--
Textbook	"Building Construction Handbook", 10th Ed., Routledge, 2014
Lab./Computer Work/Project	Emphasis on: "**Landscape Construction Design**"

ARC451	Landscape & Site Planning (Course Type A)	3 CH (1,4,0)
Course Contents	This course provides an in-depth look at the principles of landscape architecture and site planning, focusing on designing outdoor spaces that harmonize with natural and built environments. Students will learn to assess site conditions, incorporate ecological and cultural factors, and apply spatial planning techniques to a range of projects. Emphasis is placed on sustainable practices, aesthetics, and functionality, equipping students with the skills to create landscapes that enhance both environmental health and human experience.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. **"Site Planning and Design Handbook"** by *Thomas H. Russ* Site Planning and Design Handbook 2E (PB) - Thomas Russ - Google Books	
Lab./Computer Work/Project	Emphasis on: "**Landscape & Site Planning**"	

ARC452	Detailed Neighborhood Design (Course Type B)	2 CH (1,2,0)
Course Contents	This course explores the intricacies of neighborhood design, focusing on creating cohesive, functional, and sustainable communities. Students will learn to address aspects such as layout, pedestrian accessibility, mixed-use spaces, and green infrastructure within neighborhood planning. By analyzing existing neighborhoods and crafting design proposals, students develop skills in integrating social, economic, and environmental considerations. Emphasis is placed on practical solutions that foster community interaction, enhance livability, and support resilient, adaptable urban neighborhoods for diverse populations.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. **The Urban Design Handbook: Techniques and Working Methods"** by *Raymond Gindroz and Urban Design Associates* Urban Design Handbook: Techniques And Working Methods - Ray Gindroz, Urban Design Associates - Google Books	
Lab./Computer Work/Project	Emphasis on: "**Detailed Neighborhood Design**"	

ARC453	Designing Urban Spaces (Course Type A)	3 CH (1,4,0)
Course Contents	The "Designing Urban Spaces and Housing" course focuses on the interplay between architecture, urban design, and housing within contemporary urban settings. It explores how public spaces and housing solutions can be integrated to foster vibrant, inclusive, and sustainable communities. Students engage in analytical and design-based exercises, addressing real-world challenges related to density, spatial organization, social interaction, and environmental considerations. The course emphasizes the importance of contextual design thinking to balance social needs with architectural innovation and urban planning principles	
Prerequisite (s)	--	

Textbook	1. **"A Pattern Language: Towns, Buildings, Construction" by Christopher Alexander et al.** 2. **"Design with Nature" by Ian L. McHarg** 3. The Social Logic of Space" by Bill Hillier and Julienne Hanson 4. **"Urban Design: A Typology of Procedures and Products" by Jon T. Lang**
Lab./Computer Work/Project	Emphasis on: "**Designing Urban Spaces and Housing**"

ARC454	**Sustainable Urban Mobility and Green Energy (Course Type B)**	**2 CH (1,2,0)**
Course Contents	This course will deal with topics such as transport, mobility, and sustainability in different parts of the world, to improve public transport in the MENA area. Some of the most relevant aspects to be discovered are: how the European legal framework is being implemented, what strategies are being developed to implement the PEMUS, and what are the new sustainable transport alternatives to the private car. Finally, the new challenges facing large cities, the evolution, impacts, and intramodality in the transport sector, as well as mitigation plans based on green energy are also highlighted.	
Prerequisite (s)	--	
Textbook	1. **"Renewable Energy and Sustainable Buildings: Sustainable Energy Developments"** by *Ali Sayigh* 2. **"Sustainable Urban Mobility Pathways"** by Oliver Lah Sustainable Urban Mobility Pathways: Policies, Institutions, and Coalitions ... - Google Books 3. Smart Energy for Smart Transport Smart Energy for Smart Transport: Proceedings of the 6th Conference on Sustainable Urban Mobility, CSUM2022, August 31-September 2, 2022, Skiathos Island, Greece | SpringerLink	
Lab./Computer Work/Project	Emphasis on: "**Sustainable Urban Mobility and Green Energy**"	

ARC455	**City Planning and Urban Mobility (Course Type A)**	**3 CH (1,4,0)**
Course Contents	This course introduces the history of city planning and transportation, the course focuses on sustainable urban transportation systems and the impacts of contemporary urban planning approach on urban mobility, as well as the integration between man-powered mobility and other multi-modal. The course identifies diverse transportation systems, Smart growth, mobility transit-oriented Development (TOD), and city planning.	
Prerequisite (s)	--	
Textbook	1. Levy, J. M. (2009). Contemporary urban planning. Upper Saddle River: Pearson/Prentice Hall. 2. Rodrigue, J. P., Comtois, C., & Slack, B. (2016). The geography of transport systems.Routledge. 3. Richardson, A. J., Ampt, E. S., & Meyburg, A. H. (1995). Survey methods for transport planning. Melbourne: Eucalyptus Press.	
Lab./Computer Work/Project	Emphasis on: "**City Planning and Urban Mobility**"	

ARC456	**Transportation and Land Use Planning(Course Type A)**	**3 CH (1,4,0)**
Course Contents	This course introduces the history of city planning and transportation, the course focuses on sustainable urban transportation systems and the impacts of contemporary urban planning approach on urban mobility, as well as the integration between man-powered mobility and other multi-modal. The course identifies diverse transportation systems, Smart growth, mobility transit-oriented Development (TOD), and city planning.	

Prerequisite (s)	--
Textbook	1. Rodrigue, J. P., Comtois, C., & Slack, B. (2016). The geography of transport systems Routledge.
Lab./Computer Work/Project	Emphasis on: "**Transportation and Land Use Planning**"

ARC357	Landscape Planting Design (Course Type B)	2 CH (1,2,0)
Course Contents	It examines the art and science of selecting and arranging plants to enhance outdoor spaces. Students will explore plant characteristics, ecological principles, and aesthetic considerations while developing skills in creating cohesive planting plans. The course emphasizes the relationship between plants and their environments, addressing factors such as climate, soil conditions, and maintenance needs. Through hands-on projects and fieldwork, participants will gain practical experience in designing vibrant, sustainable landscapes that contribute to biodiversity and environmental health.	
Prerequisite (s)	--	
Textbook	1. Oudolf, P., & Kingsbury, N. (2005). Planting design: Gardens in time and space. Timber Press (OR). (https://books.google.com.eg/books/about/Planting_Design.html?id=vWglAQAAMAAJ&redir_esc=y) 2. Alexander, R., & Myers, R. (2017). The essential garden design workbook: Completely revised and expanded. Timber Press. (https://books.google.com.eg/books/about/The_Essential_Garden_Design_Workbook.html?id=DJHbDAEACAAJ&redir_esc=y)	
Lab./Computer Work/Project	Emphasis on: "**Landscape Planting Design**"	

ARC458	Special Topics in Landscape Architecture (Course Type B)	2 CH (1,2,0)
Course Contents	It provides an in-depth exploration of contemporary issues and emerging trends in the field. Students will engage with a variety of subjects, such as sustainable practices, urban ecology, and cultural landscapes, through lectures, discussions, and case studies. The course encourages critical thinking and innovation, allowing participants to investigate specific challenges and opportunities in landscape architecture. By collaborating on projects and presentations, students will develop a nuanced understanding of how these topics influence design and practice today.	
Prerequisite (s)	As advised	
Textbook	1. https://www.lafoundation.org/what-we-do/research/landscape-performance 2. Gething, B., & Puckett, K. (2013). Design for climate change. (https://www.ribabooks.com/design-for-climate-change_9781859464489) 3. Walliss, J., & Rahmann, H. (2016). Landscape Architecture and Digital Technologies: Re-conceptualising design and making. Routledge. (https://books.google.com.eg/books/about/Landscape_Architecture_and_Digital_Techn.html?id=6YiPCwAAQBAJ&redir_esc=y)	
Lab./Computer Work/Project	Emphasis on: "**Special Topics in Landscape Architecture**"	

ARC459	Reading the Contemporary Landscape (Course Type A)	3 CH (1,4,0)
Course Contents	The course invites the students to explore the interplay between culture, environment, and urban design. Through critical analysis of various landscapes, participants will examine how contemporary issues shape spatial experiences and perceptions. The course encourages engagement with diverse methodologies, including site visits, visual documentation, and	

	theoretical readings, fostering a deeper understanding of the evolving relationship between society and its environments. Students will cultivate skills in observation, interpretation, and discourse relevant to contemporary landscape practices.
Prerequisite (s)	--
Textbook	1. Corner, J. (1999). Recovering Landscape: Essays in contemporary landscape theory. Princeton Architectural Press. (https://books.google.com.eg/books/about/Recovering_Landscape.html?id=aGAVHkQBTGkC&redir_esc=y) 2. Corner, J. (2014). The Landscape Imagination: Collected Essays of James Corner 1990-2010. Princeton Architectural Press. (https://books.google.com.eg/books/about/The_Landscape_Imagination.html?id=jcbcngEACAAJ&redir_esc=y) 3. Wall, E., & Waterman, T. (2017). Landscape and agency: Critical essays. Routledge. (https://books.google.com.eg/books/about/Landscape_and_Agency.html?id=qNkrDwAAQBAJ&redir_esc=y)
Lab./Computer work/Project	Emphasis on: "**Reading the Contemporary Landscape**"

ARC461	**Environmental & Building Performance (Course Type A)**	**3 CH (1,4,0)**
Course Contents	The course is designed to explore the relationship between buildings and their environmental impact. It focuses on sustainable design, energy efficiency, and the use of advanced technologies to improve indoor environments. Students will learn to assess and optimize building performance, considering factors like energy consumption, air quality, and thermal comfort. The course emphasizes practical methods for reducing environmental footprints while enhancing occupant well-being and operational efficiency in architectural and engineering projects.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Tucker, L. M. (2014). Sustainable building systems and construction for designers. Bloomsbury Publishing. (https://books.google.com.eg/books/about/Sustainable_Building_Systems_and_Constru.html?id=FdDWEAAAQBAJ&redir_esc=y) 3. De Wilde, P. (2018). Building performance analysis. John Wiley & Sons. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119341901?msockid=0ce33338dcd26aa7317d203cddae6b2e	
Lab./Computer Work/Project	Emphasis on: "**Environmental & Building Performance**"	

ARC363	**Material Studies & Environmental Design (Course Type B)**	**2 CH (1,2,0)**
Course Contents	The course examines the role of materials in sustainable architecture and design. This course covers the properties, performance, and environmental impact of various materials used in construction. Students will explore how material choices influence energy efficiency, durability, and aesthetics while considering their ecological footprint. The course blends theory with practical applications, enabling students to develop innovative design solutions that balance functionality, sustainability, and environmental responsibility in the built environment.	
Prerequisite (s)	--	
Textbook	Lecture Notes and Instructor's Handouts related to chosen topics. Fernandez, J. (2006). Material architecture: Emergent materials for innovative buildings and ecological construction. Taylor & Francis. Cornejo, D. N., & Haro, J. L. (2009). Building materials: Properties, performance, and	

	applications. (https://books.google.com.eg/books/about/Building_Materials.html?id=zRhqPgAACAAJ&redir_esc=y)
Lab./Computer Work/Project	Emphasis on: "**Material Studies & Environmental Design**"

ARC463	Zero-Plus Energy Buildings (Course Type A)	3 CH (1,4,0)
Course Contents	The course focuses on designing structures that produce more energy than they consume. The course delves into advanced building techniques, renewable energy systems, and strategies for maximizing energy efficiency. Students will explore concepts like solar power, energy storage, and smart technologies, learning how to integrate them into architectural designs. Emphasis is placed on creating buildings that not only meet sustainability goals but also contribute surplus energy back to the grid, promoting energy-positive solutions.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Hootman, T. (2012). Net zero energy design: A guide for commercial architecture. John Wiley & Sons. https://www.perlego.com/book/1003474/net-zero-energy-design-a-guide-for-commercial-architecture-pdf	
Lab./Computer Work/Project	Emphasis on: "**Zero-Plus Energy Buildings**"	

ARC364	Climate, Energy, & Architecture (Course Type B)	2 CH (1,2,0)
Course Contents	The "Climate, Energy, & Architecture" course explores the relationships between building design, climate conditions, and energy efficiency. It examines how architectural solutions can mitigate environmental impacts through sustainable materials, energy-efficient systems, and passive design strategies. Students will learn about the integration of renewable energy in buildings, thermal comfort, and the role of climate-responsive architecture. The course combines theoretical lectures with practical tutorials to address real-world challenges in designing for a sustainable future.	
Prerequisite (s)	--	
Textbook	Dahl, T. (2010). Climate and Architecture. Routledge. Taylor & Francis.	
Lab./Computer Work/Project	Emphasis on: "Climate, Energy, & Architecture"	

ARC465	Environmental Architecture Design Techniques (Course Type A)	3 CH (1,4,0)
Course Contents	The course focuses on methods for creating sustainable, eco-friendly buildings. The course teaches students to apply design strategies that minimize environmental impact while enhancing building performance. Topics include passive design, energy efficiency, and the integration of natural systems into architecture. Through hands-on projects and theoretical study, students will explore how to balance aesthetics, functionality, and sustainability, learning techniques to design structures that work harmoniously with their surroundings and reduce resource consumption.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Ching, F. D. K., & Shapiro, I. M. (2014). Green Building Illustrated. John Wiley & Sons. https://books.google.com.eg/books/about/Green_Building_Illustrated.html?id=I_UFEAAAQBAJ&redir_esc=y 3. Thomas, R., & Garnham, T. (2007). The Environments of Architecture: Environmental design in context. Taylor & Francis.	

	https://www.taylorfrancis.com/books/mono/10.4324/9780203799406/environments-architecture-trevor-garnham-randall-thomas
Lab./Computer Work/Project	Emphasis on: "Environmental Architecture Design Techniques"

ARC466	Special Topics in Environmental Design (Course Type B)	2 CH (1,2,0)
Course Contents	The course offers an in-depth exploration of emerging issues and innovative approaches in sustainable design. The course covers a range of current environmental challenges, design strategies, and technologies shaping the future of architecture and urban planning. Students will engage in advanced topics such as green infrastructure, climate-responsive design, and ecological urbanism. Through case studies and projects, the course encourages creative problem-solving to address sustainability in both local and global contexts.	
Prerequisite (s)	As advised	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Beatley, T. (2016). Handbook of Biophilic City Planning & Design. Island Press. 3. https://link.springer.com/book/10.5822/978-1-61091-621-9	
Lab./Computer Work/Project	Emphasis on: "**Special Topics in Environmental Design**"	

ARC471	Furniture Production and Technical Drawings (Course Type A)	3 CH (1,4,0)
Course Contents	The course examines the processes and technologies involved in modern furniture production. Students will explore various manufacturing techniques, materials, and the role of technology in streamlining production. The course covers key topics such as woodworking, metal fabrication, and upholstery, alongside advancements like CNC machining and sustainable practices. Through practical projects and case studies, students will gain hands-on experience and a comprehensive understanding of how design concepts are brought to life in today's furniture industry.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Postell, J. (2012). Furniture design. John Wiley & Sons. https://books.google.com.eg/books/about/Furniture_Design.html?id=kBG hNk4s34C&redir_esc=y 3. Lawson, S. (2013). Furniture design: An introduction to development, materials, manufacturing. Hachette UK. https://books.google.com.eg/books/about/Furniture_Design.html?id=c_UgEAAAQBAJ&redir_esc=y	
Lab./Computer Work/Project	Emphasis on: "**Furniture production and technology**"	

ARC481	Geospatial Analysis for Risk and Performance Management in Architecture (Course Type A)	3 CH (1,0,4)
Course Contents	This course trains students on using geospatial tools to assess and manage risks in architectural projects. This course would involve creating dashboards and using ArcGIS GeoBIM to visualize safety, risk, and performance across BIM project components. Key Topics covered in this course are Risk assessment in architecture, performance monitoring, visualization of project issues, and geographic feature mapping.	
Prerequisite (s)	--	
Textbook	- ESRi (2019). Operational Intelligence: Location Provides a Common Language to Drive Efficiency. Esri.	
Lab./Computer work/Project	Emphasis on: "**Geospatial Analysis for Risk and Performance Management in Architecture**"	

ARC482	Integrated Project Coordination and Site Management Using GIS & BIM [GeoBIM] (Course Type A)	3 CH (1,0,4)
Course Contents	This course integrates project coordination and field operations in architecture, leveraging GIS and BIM. Students will master managing design collaboration, timelines, and site operations using tools like ArcGIS GeoBIM and Field Maps. Key topics include collaborative design, issue tracking, construction site monitoring, field data collection, and risk and safety management through GIS-BIM integration. dashboards; and Construction site planning with geospatial data.	
Prerequisite (s)	--	
Textbook	- Esri (2019). Building Smart Infrastructure in a Digital Age: Global Innovators. Esri. - Esri (2019). Contextual Intelligence How Location Technology Overcomes Complexity.	
Lab./Computer Work/Project	Emphasis on: "**Integrated Project Coordination and Site Management Using ArcGIS GeoBIM**"	

ARC483	GeoBIM for Sustainable Development Goals (SDGs): Asset and Facilities Management (Course Type A)	3 CH (1,0,4)
Course Contents	This course examines how GeoBIM integrates GIS and BIM to advance Sustainable Development Goals (SDGs) in Asset and Facilities Management. Students will learn to apply GeoBIM tools to challenges in areas like clean water, energy, infrastructure, and sustainable cities. The course offers both theoretical and practical knowledge, using case studies to develop asset management strategies and foster interdisciplinary collaboration in architectural engineering, facilities management, and geographic information science.	
Prerequisite (s)	--	
Textbook	- Esri (2019). Building Smart Infrastructure in a Digital Age: Global Innovators. Esri. - Esri (2019). Contextual Intelligence How Location Technology Overcomes Complexity. Esri. - ESRi (2019). Operational Intelligence: Location Provides a Common Language to Drive Efficiency. Esri.	
Lab./Computer work/Project	Emphasis on: "**GeoBIM for Sustainable Development Goals (SDGs): Asset and Facilities Management**"	

ARC493	Environmental Landscape Architecture Project	5 CH (1,7,0)
Course Contents	It is a hands-on course that guides students through the complete design process of a Environmental Landscape Architecture from concept to execution. Participants will work on real-world scenarios, developing skills in site analysis, design development, and project management. Emphasis will be placed on collaboration, creativity, and problem-solving as students create comprehensive design proposals that incorporate sustainability and functionality. Through critiques and presentations, students will refine their design strategies and learn to communicate their ideas effectively to diverse audiences.	
Prerequisite (s)	--	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. Workshop, D. (2015). Landscape architecture documentation standards: Principles, guidelines, and best practices. John Wiley & Sons. (https://books.google.com.eg/books/about/Landscape_Architecture_Documentation_Sta.html?id=NwIlCgAAQBAJ&redir_esc=y) 3. Reid, G. (2012). Landscape graphics: Plan, section, and perspective drawing of landscape spaces. Watson-Guptill. (https://books.google.com.eg/books/about/Landscape_Graphics.html?id=iMK1zYIH1W8C&redir_esc=y)	
Lab./Computer Work/Project	Emphasis on: "**Environmental Landscape Architecture Project**"	

ARC494	GIS for Smart Cities Project	5 CH (1,7,0)
Course Contents	It hands-on course that guides students through the complete design process of a ArcGIS for Smart Cities from concept to execution. Participants will work on real-world scenarios, developing skills in site analysis, design development, and project management. Emphasis will be placed on collaboration, creativity, and problem-solving as students create comprehensive design proposals that incorporate sustainability and functionality. Through critiques and presentations, students will refine their design strategies and learn to communicate their ideas effectively to diverse audiences.	
Prerequisite (s)	--	
Textbook	- Esri (2019). Building Smart Infrastructure in a Digital Age: Global Innovators. Esri. - Esri (2019). Contextual Intelligence How Location Technology Overcomes Complexity. Es - ESRi (2019). Operational Intelligence: Location Provides a Common Language to Drive Efficiency. Esri.	
Lab./Computer Work/Project	Emphasis on: "**GIS for Smart Cities Project**"	

ARC495	Applied Project in Interior Design	5 CH (1,7,0)
Course Contents	This course provides a comprehensive framework for students to undertake a full-scale interior design project from concept to execution. Participants will develop skills in project management, spatial planning, and client interaction while applying theoretical knowledge to real-world scenarios. Through collaborative work, students will create design proposals that reflect current trends and address practical needs. The course emphasizes critical thinking, problem-solving, and presentation skills, preparing students to effectively communicate their design visions and implement successful interior environments.	
Prerequisite (s)	As advised	
Textbook	1. Lecture Notes and Instructor's Handouts related to chosen topics. 2. James A. Dunnett (2015), Designing Interior Architecture: Concept, Technique, and Craft. 3. Sara E. McFadden (2019), Creative Projects for the Interior Design Student.	
Lab./Computer Work/Project	Emphasis on: "**Interior Design**"	

10B. Biomedical Engineering Course Descriptions

BMExxx Courses

BME231	Biology 3 CH (2,2,0)
Course Contents	Basic concepts of life, Molecular requirements of life, Animal organization and cellular function,cell and its components, Cells and energy, Procurement and transduction, Utilization and control of cellular metabolism, Architectural pattern of animal, Grades of organization Tissues, Organs and systems, Digestion, Respiration, Waste disposal and transport mechanisms, Introduction to embryology, Principles of inheritance, Physiochemical principles, Vitamins, Hormones and Hormonal assay, Enzymes and enzymeassay, Nucleotides DNA & RNA, Chemistry and function. Nucleic acid: Synthesis, Genetic Code and genetic transcription.
Prerequisite (s)	--
Textbook	Lisa Urry, Michael Cain, Steven Wasserman, Peter Minorsky, Jane Reece, "Campbell Biology", 11th Edition, Pub. Pearson, 2021
Lab./Computer	--

BME311	Biomedical Instrumentation 3 CH (2,2,1)
Course Contents	Overview of medical instrumentation, focusing on the principles and applications of devices used in clinical settings. It begins with electrode theory and the design and use of biopotential electrodes for acquiring physiological signals. Studying various biomedical transducers and their role in converting biological parameters into measurable signals. The course covers the basics of cardiovascular and respiratory systems, including associated measurement techniques. Additionally, it introduces instrumentation for patient care and monitoring, as well as systems used for sensory measurement and behavioral studies in both research and clinical environments.
Prerequisite (s)	**EED314**
Textbook	WEBSTER, John G. (5^{th}ed.). Medical instrumentation: application and design. John Wiley & Sons, 2020.
Lab./Computer work/Project	Project development/simulation of a simple biomedical device

BME312	Medical Electronics 3 CH (2,2,1)
Course Contents	Review of basic analog electronics. Study different sensors and electrodes in biomedical applications. Operational amplifiers, instrumentation amplifiers, and isolation amplifiers in biomedical applications. Design of op-amp-based active filters in biomedical instrumentation. Sources of noise and design of low-noise amplifiers for biomedical applications. Hold circuits and quantization noise are also treated, and A/D and D/A converters are described. Design of digital filters, Biotelemetry with voltage controlled oscillators and phase locked loop, Voltage to frequency conversion, and Applications of microcontrollers in medical systems.
Prerequisite (s)	**EED311**
Textbook	**Textbook**: Robert B. Northrop, Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation, CRC Press, recent edition.

Lab./Computer work/Project	**Exp. 1:** Operational amplifiers in biomedical instrumentation **Exp. 2:** Instrumentation amplifiers in biomedical instrumentation **Exp. 3:** Electrocardiograph (ECG) amplifiers in biomedical instrumentation **Project Work:** Design and implementation of a suggested application in the area of the course.

BME321	**Biomaterials 3 CH (2,2,0)**
Course Contents	Materials science: mechanical characterization of materials: tensile, creep, stress relaxation, fatigue, impact, and hardness tests. composition of human tissues, Man-made material structure and bonds, Implant materials, nature of metals and alloys, nonmetallic materials, characteristics of biopolymers, ceramics, porous structures, composite materials, Mechanical testing, viscoelastic behavior of biomaterials, Friction, Wear and lubrication, Corrosion, Properties of biological materials, biocompatibility, cytotoxicity, osseointegration of implants, tissue engineering, biodegradable materials, bone adaption to mechanical stimulus.
Prerequisite (s)	**BME331**
Textbook	Susana Diaz-Amaya, Lia Stanciu, “Introductory Biomaterials : an Overview of Key concepts”, Elsevier Science & Technology2021
Lab./Computer	--

BME331	**Anatomy and Physiology 3 CH (2,1,1)**
Course Contents	Principles of human body anatomy, Human surface anatomy, Head & neck, Upper & Lower Limbs, Abdominal organs, Nervous system (brain and Spinal cord), Skeletal & Circularity systems, the respiratory system, urinary system. Cells, Membranes, Nerves, Muscles, Blood, Body fluids, Action Potentials, Electrophysiological measurements, Motion and posture, Circulatory system: Regulation, Homodynamic, Cardiac output and control, Respiratory system:, Renal system: Transport processes, Fluid exchange, Acid, Base regulation, Gastrointestinal system: Digestion and absorption, Liver function, Temperature regulation, Endocrine system:, Reproductive systems, electrophysiological measurements.
Prerequisite (s)	-
Textbook	Elaine Marieb “Human Anatomy & Physiology” 11th Ed., Pearson, 2018
Lab./Computer work/Project	demonstration of different parts of the body using anatomical models

BME341	**Medical Signal Processing 3 CH (2,2,1)**
Course Contents	Discrete-time signals and systems, Z-transform, DFT, FFT, and Hilbert transforms, emphasizing applications in biomedical signals such as ECG and EEG. Topics include digital filter design, spectral estimation methods, and homomorphic processing. The course extends to time-frequency analysis (STFT, wavelets), adaptive filtering, and feature extraction for clinical diagnostics. Practical applications involve real-world biomedical datasets, with a focus on denoising, compression, and machine learning techniques, providing a foundation for modern biomedical signal analysis and real-time healthcare systems.
Prerequisite (s)	**EED231**
Textbook	Obeid, Iyad, Ivan Selesnick, and Joseph Picone, eds. Biomedical signal processing: innovation and applications. Springer Nature, 2021.
Lab./Computer work/Project	Computer simulation for simple image processing techniques

BME342	Medical Image Processing 3 CH (2,2,1)
Course Contents	Fundamentals of Digital Image Processing (Image Formation and Representation, Sampling and Quantization, Color Space, and Reconstruction from Projections) – Intensity Transformation and Image Enhancement (Histogram Equalization and Matching) – Noise Types and Image Restoration (Inverse, Pseudo-Inverse, and Wiener Filters) – Filtering in the Spatial Domain (Linear and Non-linear Filters) – Edge Detection and Enhancement – Filtering in the Frequency Domain (Low- and High-Pass Filters) – Morphological Image Processing – Basic Overview of X-ray and CT Imaging Principles and Factors Affecting Image Quality, With Motivating Examples Drawn from Radiology.
Prerequisite (s)	**EED231**
Textbook	Geoff Dougherty, “Medical image processing: techniques and applications”, Spinger, 2011
Lab./Computer work/Project	Computer simulation for simple image processing techniques

BME411	Biomedical Equipment 3 CH (2,2,0)
Course Contents	Types and Classes of Medical Equipment, Diagnostic Devices; imaging devices: X-ray machines, ultrasound scanner, CT scanner. Monitoring devices: Patient monitoring devices, Electrocardiograph machine, Sphygmomanometer, EEG, EMG, Pulse oximetry, glucometer. Endoscopy systems: laparoscopy, endoscopy; Electrosurgical Units; Electrocautery. Therapeutic Devices: infusion pump, syringe pump, insulin pump, infant incubator. Laboratory devices: Spectrophotometer, microscope, centrifuge, hematology analyzers. Rehabilitation devices: Physiotherapy ultrasound devices, prosthetic and exoskeleton. Electrical safety of medical equipment, standards and regulations for medical equipment manufacturing and management.
Prerequisite (s)	**BME331**
Textbook	John Enderle, Susan Blanchard, and Joseph Bronzino, "Introduction to Biomedical Engineering", Academic Press, 2000
Lab./Computer work/Project	Project development/simulation of a simple biomedical device

BME412	Advanced Biomedical Equipment 3 CH (2,2,0)
Course Contents	Life support equipment including ventilators, anesthesia machines, hemodialysis systems, and infant incubators, highlighting their principles and clinical applications. Physiotherapy and electrotherapy devices such as high-frequency heat therapy and ultrasonic therapy units. Advanced imaging technologies are addressed, including ultrasonic imaging, nuclear medicine imaging, MRI, and thermal imaging systems. The course also covers radiotherapy equipment like high-voltage X-ray machines and linear accelerators, as well as telemedicine technologies and remote monitoring technologies. Wearable and implantable devices. Artificial heart lung machine. Biomedical laser applications in diagnostics, surgery, and therapeutic interventions.
Prerequisite (s)	**BME411**
Textbook	Khandpur RS. Biomedical instrumentation: Technology and applications. New York: Mcgraw-hill; 2005. Sahin M. Instrumentation Handbook for Biomedical Engineers. CRC Press; 2020
Lab./Computer work/Project	As advised

BME421	Stress Analysis 3 CH (2,2,0)
Course Contents	Overview of loads, stress (axial, bending and shear), stress and strain relations, normal and shear stresses, bending stresses, combined loading, safety factor in mechanical design, shear force and bending moment diagrams in statically determinate, shear force and bending moment diagrams in statically determinate indeterminate beams, State of stress (2D), principle stresses, Stress at an angle, Mohr's circle and Geometrical properties of Mohr's circle Principle strains, correlating bone adaptation to mechanical stimulus Experimental Stress Analysis.
Prerequisite (s)	**BME331**
Textbook	Russell Hibbeler, Mechanics of Materials11th ed., Pearson, 2022.
Lab./Computer	--

BME422	Biomechanics 3 CH (2,2,1)
Course Contents	Introduction to biomechanics, combining and resolving forces in human members, levering system in humans, analyzing human moving members. Biomechanics of the musculoskeletal system, Principles of strength of materials applied to the skeletal system, Biomechanics of structures and tissues of the musculoskeletal system, Biomechanics of selected joints (Spine, Hip joint), Selected topics in biomechanics of bone (Bone as a composite material, bone fracture,functionaladaptationofbone),ArtificialHipJoint,DesignofUpper-LimpProsthesis.
Prerequisite (s)	**BME421**
Textbook	Russell Hibbeler, Mechanics of Materials11th ed., Pearson, 2022
Lab./Computer	--

BME441	Bioinformatics 3 CH (2,2,0)
Course Contents	Introductionto bioinformatics, focusing on the relationship between genotype and phenotype, the principles of evolution, and the nature and transmission of biological information. The course covers fundamental aspects of cellular biology, microarrays, gene expression profiling, genomics, and phenomics. It explores probabilistic modeling, statistical inference, and machine learning techniques, including neural networks and probabilistic graphical models. evolutionary models and phylogenetic tree construction. Applications in medical research including disease gene mapping, biomarker discovery, computational drug design, and the development of personalized medicine strategies.
Prerequisite (s)	**EMP115**
Textbook	Ramsden J. Bioinformatics: an introduction. Springer Nature; 2023.
Lab./Computer	--

BME442	Analytical Instruments and Bioanalysis 3 CH (2,2,0)
Course Contents	Radiation and matter, Absorption of radiation in ultraviolet and visible regions: Sources and detectors, Visual Colorimeters, Filter photometers, Spectrophotometers, spectrophotometery , Absorption of radiation in Infrared region: Sources and detectors, Infrared spectrophotometers, Molecular luminescence, Fluorescence and phosphorescence, Spectrofluorometry, Spectropolarimetry, Flame photometry, Atomic absorption, Chromatography (HPLC & GC), Water purification, Balances, Centrifuges, Electrophoresis, Molecular biology techniques, Scattering of radiation, Laser: sources, and applications in chemistry and spectroscopy, Chromatography, Automation, Performance evaluation, Calibration of analytical instrumentation, Analytical laboratory skills, Practical training in clinical sites.
Prerequisite (s)	**BME341**
Textbook	R.S. Khandbur, Biomedical Instrumentations: Technology and Applications, TATA McGraw

	Hill, 2023
Lab./Computer	--

BME443	**Advanced Medical Image Processing Techniques 3 CH (2,2,0)**
Course Contents	key concepts in medical image analysis and computer vision, including segmentation, registration, and feature extraction. Students learn to handle uncertainty in the diagnostic process, understanding the implications of scale, resolution, and confidence levels in imaging interpretation. Core imaging modalities are thoroughly covered, including the principles and algorithms of projection tomography, XCAT phantoms, SPECT, and PET.Additional modules include biochemical imaging, Scatchard plots for receptor-ligand analysis, and gamma camera functionality. Safety standards, radiation protection, and ethical considerations in the use of imaging systems. Futuretrends in AI-integrated imaging diagnostics.
Prerequisite(s)	**BME342**
Textbook	Geoff Dougherty, "Medical image processing: techniques and applications", Spinger, 2011 Lalumera E, Fanti S, editors. Philosophy of advanced medical imaging. Springer Nature; 2021.
Lab./Computer work/Project	Computer simulation for advanced techniques in image processing

BME444	**Biometrics 3 CH (2,2,0)**
Course Contents	The fundamentals of biometric recognition systems, beginning with feature vector extraction and feature space representation. Studying core machine learning algorithms used for classification and recognition, as well as principles of pattern recognition, template matching, and shape analysis. Applications include the recognition of various human traits such as fingerprints, hand geometry, vein patterns, iris detection, face recognition, thermographic profiles, speech, and keystroke dynamics.Multimodalsystems that combine multiple traits. Evaluating the performance, accuracy, and reliability of biometric recognition devices in practical scenarios.
Prerequisite (s)	**BME341 and BME342**
Textbook	1. A.K. Hain, A.A. Ross & k. Nandakumar,"Introduction to biometics", Springer, 2011 2. Sun Z, Li Q, Liu Y, Zhu Y. Opportunities and challenges for biometrics. China's e-Science Blue Book, 2021.
Lab./Computer	--

BME451	**Clinical Engineering 3 CH (2,2,1)**
Course Contents	Hospital based clinical engineering: quality control, hospital organization, Acquisition of equipment: technical assessment and data analysis, inspection and testing of medical instruments and systems, Inventory control: manufacturer, model and serial number, purchase date and price, warranty ..,etc, Preventive maintenance and inspection: prolong the useful life of an equipment, reduce failure, reduce operating costs, calibration, ... Etc, Performance assurance check, Electrical safety in hospitals, Radiation protection, Biological safety, Mechanical & environmental safety
Prerequisite (s)	**BME411**
Textbook	1. Dyro J, ed. Clinical engineering handbook. Elsevier; 2004. 2.Taktak A, Ganney P, Long D, Axell R, editors. Clinical engineering: a handbook for clinical and biomedical engineers. Academic Press; 2019.
Lab./Computer work/Project	Simulation and modeling for some department and activities in the hospital environment

BME452	Hospital Design and Management 3 CH (2,2,0)
Course Contents	Hospital structure and infrastructure planning. Key hospital components and functional interactions, improving workflow in modern hospital design concepts and patient care. Hospital departments classification, sizing, spatial layout, location planning, functional components, and architectural and regulatory design criteria, modern hospital commissioning processes,. Facility layout methodologies, efficient space and resource allocation, leaning healthcare principles, and operational workflow optimization Standards and processes for hospital accreditation, infection control requirements, and integration of smart technologies. design and maintenance of medical gases, vacuum systems, and critical hospital utilities.
Prerequisite (s)	**BME411**
Textbook	Garg A, "Handbook on Hospital planning and designing, Springer, 2024
Lab./Computer	--

BME461	Selected Topics in Biomedical Engineering 3 CH (2,2,0)
Course Contents	Independent study in various advanced areas of biomedical engineering may be assigned to individual students or to groups, Readings assigned and frequent consultations held.
Prerequisite (s)	As advised
Textbook	As advised
Lab./Computer work/Project	As advised

BME462	Nanophysics and Nanotechnology 3 CH (2,2,0)
Course Contents	Principles of nanotechnology, fabrication, characterization, and functionality of nanoscale structures. materials science at the nanoscale, nanosurface engineering, atomic structure, and particle orientation. quantum effects, self-assembly techniques, and scanning probe microscopy. biomedical and environmental applications of nanomaterials, including targeted drug delivery, biosensors, and tissue engineering, as well as their role in energy storage, nanoelectronics, and catalytic systems. integration of nanomaterials in medical implants and diagnostic tools. design and evaluation of nanostructures used in biomedical systems.
Prerequisite (s)	**BME321**
Textbook	1. Applications of Nanotechnology in Biomedical Engineering, Edited By Piyali Basak, Pratik Das, Suvendu Manna, Tridib Kumar Sinha, ISBN 9781032485843 Published December 20, 2024 by CRC Press. 2. Nanotechnology for Bioengineers (Synthesis Lectures on Biomedical Engineering), by Wujie Zhang, ISBN-13 : 978-1681739212, 2020.
Lab./Computer	--

BME463	Plasma Technology in Biomedical Engineering 3 CH (2,2,0)
Course Contents	Introduction to the basic concepts plasmas, plasma sources for biomedical engineering and plasma generation criteria; Paschen curves and Townsend discharge mechanisms, design and operation of compact plasma generators, as well as Langmuir probes, and optical emission spectroscopy, configurations of plasma devices, overview of applications of plasmas in the biomedical field; plasma-assisted surface modification of biomaterials, plasma-assisted decontamination, plasma focus-numerical experiments, plasma medicine, plasma in wound healing, plasma in sterilization, plasma polymerization and biomedical applications, laser-induced plasmas.

Prerequisite (s)	**EMP227**
Textbook	Boenig H. Plasma science and technology. Cornell University Press; 2019. Rawat RS. Plasma Science and Technology for Emerging Economies: An AAAPT Experience. Springer; 2017.
Lab./Computer	--

BME464	**Computer Aided Design**	**3 CH (2,2,0)**
Course Contents	The fundamentals of product design, including design methodologies and process selection strategies. It covers computer-aided geometric modeling, 3D modeling, and reverse engineering techniques, emphasizing customer-centric design and product development cycles. Platform technologies linking design with manufacturing through process flow design and analysis. Topics include designing for production, material and process selection, and the use of computer-aided tools for simulation of manufacturing processes. Real-world case studies provide practical insight into integrated product development and manufacturability in biomedical and engineering applications.	
Prerequisite (s)	**EED161**	
Textbook	Bi Z, Wang X. Computer aided design and manufacturing. John Wiley & Sons; 2020.	
Lab./Computer	--	

BME465	**Laser & Fibers Optics in Biomedical Engineering**	**3 CH (2,2,0)**
Course Contents	Basics of Light, Light Matter Interactions,Fundamentals Of Laser, Laser Tissue Interactions, Tissue Optical Properties, Simulation of Light Tissue Propagation, Light-Emitting Diodes (LEDs), Laser Diodes, Basics of Optical Fibers, Coherent Anti-Stokes Raman Scattering Microscopy,Distortion and Dispersion in Optical Fibers, Medical Laser, Laser-based Spectroscopic techniques, Optical Imaging techniques, Applications of Lasers in Diagnosis and Therapy, Applications of Lasers in Surgery, Applications of Lasers in Nanotechnology.	
Prerequisite (s)	**EED331**	
Textbook	Markolf H. Niemz, "Laser &Tissue Interactions", Springer 1996 Boas DA, Pitris C, Ramanujam N, editors. Handbook of biomedical optics. CRC press; 2016	
Lab./Computer	--	

BME466	**The Internet of Things in Medicine and Biology**	**3 CH (2,2,0)**
Course Contents	Introduction to the Internet of Things (IoT), covering the core concepts, architecture, and enabling technologies that power IoT systems. The course explores various types of sensors and sensor nodes, connectivity protocols, and network architectures essential for data communication. IoT hardware platforms, edge computing, and the integration of machine learning for intelligent decision-making. The course also covers big data analytics for processing IoT-generated data. Emphasis is placed on applications in smart healthcare, including remote monitoring, diagnostics, wearable devices, and real-time patient management systems.	
Prerequisite (s)	**BME411**	
Textbook	Balas VE, Jha S, Khari M, Kumar R, editors. Internet of things in biomedical engineering. Academic Press; 2019. Firouzi F, Nassif S, Chakrabarty K. Intelligent internet of things. Springer, 2020.	
Lab./Computer	--	

BME498	Graduation Project 1 2 CH (1,0,3)
Course Contents	An engineering assignment requiring the student to demonstrate initiative and assume responsibility, the student will select a project at the end of the ninth Semester, Students can propose their own project, a faculty member will provide supervision, a project report is required at the end of the tenth semester.
Prerequisite (s)	**As Advised**
Textbook	**As Advised**
Lab./Computer work/Project	**As Advised**

BME499	Graduation Project 2 3 CH (1,0,6)
Course Contents	Continuation to the bachelor project started in BME498
Prerequisite (s)	**BME498**
Textbook	**As Advised**
Lab./Computer work/Project	**As Advised**

10.C. Electrical Engineering Course Descriptions

EEDxxx Courses

EED161	Computer Programming 3 CH (2,0,2)
Course Contents	Students will learn problem-solving techniques using decision and loop control structures. Key software design principles such as top-down design and stepwise refinement are emphasized. The course covers functions, parameter passing, and scope, along with modular program organization. Students will work with arrays, structs, and classes to understand structured and object-oriented data management. The course also introduces recursion as a powerful tool for solving problems involving self-referential logic.
Prerequisite (s)	-
Textbook	Paul Deitel; "C++ How to Program"; 7th edition, Pearson, 2010. Frank L. Friedman; "Problem Solving, Abstraction and Design Using C++"; Prentice Hall.
Lab./Computer	-

EED211	Electrical Circuits 1 3 CH (2,2,1)
Course Contents	Basic electrical quantities, Ohm's Law, Kirchhoff's Laws, Voltage and current division, Y-Δ transformation. Techniques of solving DC electric circuits: nodal and mesh analysis, source transformation. Circuit theorems: superposition, Thevenin, Norton and Maximum power transfer. AC sinusoidal sources, Time domain and phasor representation, Inductance and capacitance: Voltage and current relationships, Impedance and admittance, Phasor diagrams, Techniques of solving AC electric circuits: Nodal analysis, Mesh analysis, and source transformation. Theorems: superposition, Thevenin, and Norton. Steady state power analysis.
Prerequisite (s)	EMP124
Textbook	C.K. Alexander and M.N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 5th edition, 2013.
Lab./Computer work/Project	**Exp. 1:** Basic measurements and basic laws. **Exp. 2:** Theorems of electric circuit analysis.

EED212	Electrical Circuits 2 3 CH (2,2,1)
Course Contents	Transient analysis: natural and step responses, in R-L, R-C, And RLC In DC Circuits, parallel and series circuits. Three phase circuits: balanced Y-Y, Δ-Δ, Y-Δ, Δ-Y Connections, Transformations, Unsymmetrical loads, Power calculation and measurements. Magnetically coupled circuits: Mutual inductance, Linear transformer equivalent circuits, Ideal transformer. Frequency response: transfer function, series and parallel resonance, passive filters, Quality factor. Two port networks: impedance, admittance, hybrid, and transmission parameters; relationship between parameters.
Prerequisite (s)	EED211
Textbook	C.K. Alexander and M.N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 5th edition, 2013.
Lab./Computer work/Project	**Exp. 1:** Transient Analysis of RL, RC, and RLC Circuits. **Exp. 2:** Three-phase circuits.

EED213	Electronics 3 CH (2,2,1)
Course Contents	Models and characteristics of ideal and practical diodes. Diode circuit applications. Special diode types. BJT transistor: basic structure, I-V characteristics, DC circuits, transistor as an amplifier and a switch, small signal operation and models, CE, CB, CC amplifier configurations, Biasing circuits. MOSFET transistor: basic structure, I-V characteristics, DC circuits, transistor as an amplifier and a switch, small signal operation and models, CS, CG, CD amplifier configurations, Biasing circuits. Single stage integrated circuits amplifier.
Prerequisite (s)	EMP227
Textbook	Adel S. Sedra, and Kenneth C. Smith, "Microelectronic Circuits", 7th edition, Oxford University Press, 2017.
Lab./Computer work/Project	**Exp. 1:** Equipment Familiarization: Establishing and Displaying Characteristics in AC Technology. **Exp. 2:** CAD tool familiarization. **Exp. 3:** Characteristics of different diodes. **Exp. 4:** Diode applications. **Exp. 5:** Single-stage amplifier circuits.

EED217	Electrical Engineering 3 CH (2,2,0)
Course Contents	Estimation of Plant Electrical Load: single line diagram, load schedule, power supply capacity. Synchronous Generators and Motors: common aspects, simplified theory, construction features. Induction Motors: three-phase motors, essential characteristics, construction, and methods of starting. Transformers: operating principle, construction, efficiency and regulation. Switchgear and Motor Control Centers: construction, switching devices, MCCB. Fuses, Cables, Wires and Cable Installation Practices. Hazardous Area Classification and the Selection of Equipment. Variable Speed Electrical Drivers.
Prerequisite (s)	EMP124
Textbook	Alan L. Sheldrake," Handbook of Electrical Engineering for Practitioners in the Oil, Gas and Petrochemical Industry", John Wiley & Sons, 2003.
Lab./Computer work/Project	--

EED218	Electrical circuits 3 CH (2,2,0)
Course Contents	Basic electrical quantities, Ohm's and Kirchhoff's Laws, source combinations, voltage and current division. Techniques of solving DC circuits: nodal analysis and mesh analysis. Theorems: superposition theorem. AC sinusoidal sources, time domain and frequency domain, voltages and currents phasor diagrams, inductance and capacitance: voltage and current relationships, impedance and admittance, Techniques of solving AC electric circuits. Steady state power analysis: Real Power, maximum power transfer theorem, complex power, and power measurement. Three phase circuits; connections: Y-Y, Y-Δ, Δ-Y, Δ-Δ, and power measurements.
Prerequisite (s)	EMP124
Textbook	C.K. Alexander and M.N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, 5th edition, 2013.
Lab./Computer work/Project	-

EED219	Electronics 3 CH (2,2,1)
Course Contents	Fundamental concepts in electronics; Diode structure, models and characteristics. Diode circuit applications. Special diode types; BJT and FET Circuits; basic structure, I-V characteristics, DC circuits, transistor as an amplifier and a switch, small signal operation and models; Operational amplifier circuits and applications; Difference and instrumentation amplifiers; Passive and active filters; Wave shaping circuits; timers, Voltage to Current, Voltage to frequency converters, and multiplier circuits; OpAmp oscillators:555 timer, Mini projects.
Prerequisite (s)	EMP124
Textbook	Adel S. Sedra, and Kenneth C. Smith, "Microelectronic Circuits", 7th edition, Oxford University Press, 2017.
Lab./Computer work/Project	**Exp. 1:** Equipment Familiarization: Establishing and Displaying Characteristics in AC Technology. **Exp. 2:** CAD tool familiarization. **Exp. 3:** Characteristics of different diodes. **Exp. 4:** Diode applications. **Exp. 5:** Single-stage amplifier circuits. **Exp. 6:** OPAMP applications. **Exp. 7:** Oscillators and 555 application circuits. **Project:** Design, implementation, and simulation of circuits suggested by the instructor.

EED222	Logic Design 3 CH (2,2,1)
Course Contents	Digital systems, coded number systems. Boolean algebra, canonical and standard forms, and digital logic gates and their integrated circuits. Gate-Level Minimization, and the map method for simplification and implementation. Combinational logic circuits: Analysis procedure, design procedure, binary adder–subtractor, multiplier, magnitude comparator, decoders, encoders, and multiplexers. Sequential logic circuits: Latches and Flip-Flops, analysis of clocked sequential circuits, and design procedure. Registers, counters, memory decoding, and programmable devices. Selected applied design examples with standard integrated circuits (ICs).
Prerequisite (s)	--
Textbook	M. Morris Mano, and Michael D. Ciletti; “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”; 6th Edition; Pearson; 2018.
Lab./Computer work/Project	**Exp. 1:** Some applications of basic logic gates. **Exp. 2:** Applications of finite state machine. **Exp. 3:** Applications of finite state machine. **Course Project:** Design, implementation, and simulation of suggested circuits by the instructor.

EED223	Computer Organization 3 CH (2,2,1)
Course Contents	Basic computer design and architecture: Design at the register transfer level, instruction codes, computer registers, timing and control, instruction cycle, memory-reference instructions, input-output, interrupt, and design of the accumulator logic, and arithmetic-logic-shift unit. Memory Hierarchy (internal, external, and cache memory). Principles of hardware design using hardware description language, and design process of digital circuit simulation including special effects; circuit design, routing, delay, and meta stability. Design examples with field programmable gate array (FPGA) chips.
Prerequisite (s)	EED222

Textbook	M. Morris Mano, and Charles Kime, Logic and Computer Design Fundamentals, Fourth Edition, Pearson Education Limited, 2014.
Lab./Computer work/Project	**Exp. 1:** HDL of the basic input-output interfaces using the FPGA. **Exp. 2:** HDL of the arithmetic-logic-shift unit (ALU) using the FPGA. **Exp. 3:** HDL for the part of the center processing unit (CPU) using the FPGA. **Exp. 4:** Some examples for different interfacing applications using the assembly language. Design and implement based on FPGA tool (Xilinx, for example), specific control circuits in the area of the course.

EED231	**Signals & Systems**	**3 CH (2,2,1)**
Course Contents	Continuous-time and discrete-time signals and systems. Linear time-invariant (LTI) systems: system properties, convolution sum and the convolution integral representation, system properties, LTI systems described by differential and difference equations. Fourier series: Representation of periodic continuous-time signals. Continuous time Fourier transform and its properties: Time and frequency shifting, conjugation, differentiation and integration, scaling, convolution, and the Parseval’s relation. Case studies using S/W tools (e.g. MATLAB).	
Prerequisite (s)	EMP213	
Textbook	B. P. Lathi, “Linear Systems and Signals”, 3rd edition, Oxford Univ. Press, 2018.	
Lab./Computer work/Project	Solve related problems using S/W tools (MATLAB for example).	

EED261	**Advanced Computer Programming**	**3 CH (2,0,3)**
Course Contents	Values and Variables: Identifiers, Control Codes within Strings, String Formatting. Expressions and Arithmetic: Mixed Type Expressions, Syntax Errors, Run-time Exceptions, Arithmetic Examples, Algorithms. Conditional Execution: Boolean Expressions: The if/else Statement, Compound Boolean Expressions, Nested Conditionals. Iteration: The while Statement, Definite Loops vs. Indefinite Loops, The for Statement, Nested Loops. Using Functions: Functions and Modules, Built-in Functions, Standard Mathematical Functions, Time Functions, Random Numbers. Writing Functions: Function Basics, Parameter Passing, Documenting Functions, Function Examples.	
Prerequisite (s)	EED161	
Textbook	Kathy Sierra and Bert Bates, Head First Java, second edition, O'Reilly, 2005. ISBN # 0-596-00920-8. **Reference Book:** Michael T. Goodrich and Roberto Tamassia, Data Structures and Algorithms in Java, fifth edition, John Wiley & Sons, 2010. ISBN # 0-470-38326-7.	
Lab./Computer work/Project	**Exp. 1:** Setup: Setting Up Your Computer. **Exp. 2:** Defining and using classes and fields, and with conditionals and recursive functions. **Exp. 3:** Practice with linked lists. **Exp. 4:** Demonstration of how a sentinel node can simplify a doubly-linked list implementation. **Exp. 5:** Practice writing code that uses inheritance and Java interfaces. **Exp. 6:** Introduction to Java's built-in facilities for exception handling.	

EED311	Electronic Circuits 4 CH (3,2,1)
Course Contents	Differential pair design, circuits of differential pairs, small signal operation of the differential amplifier, Building Blocks of Integrated Circuit Amplifiers, BJT and MOSFET current mirrors and Current Steering, Basic Gain Cell, Cascode Amplifier, multistage amplifiers. Frequency response of amplifiers, Bode plot. Feedback: General structure and topologies. Operational Amplifier: structure and operation, OpAmp integrated circuits, function and characteristics, configurations, DC and AC application circuits. Oscillators and Multivibrators: concept of oscillations, OpAmp oscillators, and the 555 timer.
Prerequisite (s)	EED213
Textbook	Adel S. Sedra, and Kenneth C. Smith, "Microelectronic Circuits", 7th edition, Oxford University Press, 2017.
Lab./Computer work/Project	**Exp. 1:** Differential and multistage amplifier. **Exp. 2:** OPAMP applications. **Exp. 3:** Oscillators and 555 application circuits. **Project:** Design, implementation, and simulation of circuits suggested by the instructor.

EED312	Integrated Circuits Devices 3 CH (2,2,1)
Course Contents	Semiconductor fundamentals: Energy-band model, PN junction diodes. MOS capacitor: Energy-band diagrams, Capacitance, non-idealities, Threshold voltage adjustment. MOSFET: Structure and operation, Long-channel I-V relationship, Small-signal model, Velocity saturation (short-channel effects, scaling). Silicon device fabrication technology: CMOS technology, SOI technology. Charge-Coupled Devices. BJT: Fundamentals, Ebers-Moll model, Base-width modulation, Early voltage, non-ideal effects, Charge control model, Base transit time, Small-signal model, Transient response. Introduction to FinFET and Carbon Nanotubes. Basics of solar cells. MOSFET and BJT PSpice models.
Prerequisite (s)	EMP227
Textbook	Chenming Hu, "Modern Semiconductor Devices for Integrated Circuits", Prentice Hall, recent edition. **Reference Book**: D.A. Neamen, "Semiconductor Physics & Devices", McGraw-Hill, recent edition.
Lab./Computer work/Project	**Exp. 1:** Estimating the diode parameters from I-V characteristics. **Exp. 2:** Simulate the I-V characteristics for bulk, and SOI Field Effect Transistors. **Exp. 3:** Simulate the nanoscale multigate-FET structures (FinFET and nanowire). **Project Work:** Design a certain device with specific parameters and technology to meet specified performance requirements within some practical design constraints.

EED313	Digital Integrated-Circuits 3 CH (2,2,1)
Course Contents	Review of CMOS processing technology: Terminologies, and Design rules. Analysis and implementation of CMOS inverter. Design of static/dynamic combinational gates (optimizing the speed, area, or power and their applications). The influence of interconnect parasitic on circuit performance and approaches to mitigate their effects. Design and analysis technique of static/dynamic sequential circuits (clocking approaches and memories). Examination of design methodologies.
Prerequisite (s)	EED213
Textbook	Jan M. Rabaey, Anantha Chandrakasan, and Borivoje Nikolic "Digital Integrated Circuits," Prentice-Hall, recent edition.
Lab./Computer work/Project	**Exp. 1:** CAD tool familiarization. **Exp. 2:** Static/Dynamic Behaviour of CMOS Inverter. **Exp. 3:** Static digital Circuits.

	Exp. 4: Dynamic digital Circuits. **Project Work:** Design full-custom digital integrated circuit using CAD tools.

EED314	**Measurements & Instrumentation 3 CH (2,1,2)**
Course Contents	Introduction to Units, Standards, and Measurements Errors. Electromechanical Instruments and DC meters. Resistance, Inductance and Capacitance measurements and DC/AC bridges. Digital Basic Instruments, Digital counters, A/D & D/A converters. Digital measuring instruments: digital multimeters and frequency meters. Cathode Ray Oscilloscopes and its applications in phase and frequency measurements, Digital Storage Oscilloscopes, Signal Generators and Spectrum Analyzer. Introduction to Sensors: Electromechanical sensors, temperature sensors, light sensors, and biomedical sensors.
Prerequisite (s)	EED213
Textbook	David A. Bell, “Electronic Instrumentation & Measurements”, OXFORD University Press, 3rd Edition, 2013.
Lab./Computer work/Project	**Exp. 1:** Measurement of Electrical Quantities using Digital Multi-Meter Instruments. **Exp. 2:** DC Circuits – Measurement and Analysis. **Exp. 3:** RMS Measurements Using the Digital Multi-meter and the Digital Oscilloscope. **Exp. 4:** Oscilloscope Specifications and Performance. **Exp. 5:** Voltage Measurement and Electric Thermometer Controlled by the Microcontroller Circuitry. **Exp. 6:** Strain Gauge Transducer. **Exp. 7:** Spectrum Analyzer Applications: Signal Amplitude and Frequency Measurements using the Mixed-Domain Oscilloscope. **Project:** Design and implementation of parts of instruments suggested by the instructor.

EED323	**Microprocessors and Microcontrollers 3 CH (2,2,1)**
Course Contents	Introduction to the microprocessor and its architecture, microprocessor hardware, programming the microprocessor using assembly language, memory interface, basic input/output (I/O) interface, with its controllers, interrupts and interrupt service procedures with their programming, microprocessor timing specifications, and timer/ counters. Hardware/software design tradeoffs. Microcontroller: its architecture, memory, digital and analog I/O interface, interrupt, timers, and programming the microcontroller using assembly language. Selected design examples with a specific microprocessor, and the other with a specific microcontroller.
Prerequisite (s)	EED223
Textbook	1- Brey, Barry B., “The Intel microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium, Pro processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit extensions: architecture, programming, and interfacing”, Pearson Prentice Hall™. 2- Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, ARM Assembly Language Programming & Architecture, 2nd Edition, 2016. 3- Sarah L. Harris and David Money Harris, Digital Design and Computer Architecture: ARM Edition, 1st Edition, 2015.
Lab./Computer work/Project	**Exp. 1:** Basic programming examples using assembly language of the memory Interface with a specific microprocessor. **Exp. 2:** Basic programming examples using assembly language of the I/O Interface with a specific microprocessor. **Exp. 3:** Programming of basic I/O Interface with a specific microcontroller. **Project:** Design and implementation of a suggested application on either a specific microprocessor or a specific microcontroller by the instructor.

EED329	Digital Systems 3 CH (2,2,1)
Course Contents	Digital systems, coded number systems. Boolean algebra, canonical and standard forms, and digital logic gates and their integrated circuits. Gate-Level Minimization, and the map method for simplification and implementation. Combinational logic circuits: Analysis procedure, design procedure, binary adder–subtractor, multiplier, magnitude comparator, decoders, encoders, and multiplexers. Sequential logic circuits: Latches and Flip-Flops, analysis of clocked sequential circuits, and design procedure. Registers, counters, Memory, and programmable devices. State machines. Memory and I/O logic elements. ADC and DAC.
Prerequisite (s)	-
Textbook	M. Morris Mano, and Michael D. Ciletti; "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog"; 6^{th} Edition; Pearson; 2018.
Lab./Computer work/Project	**Exp. 1:** Realization of logic gates circuits. **Exp. 2:** Computer simulation using available software packages.

EED331	Electromagnetic Fields 3 CH (2,2,0)
Course Contents	Different coordinate systems. **Stationary electric field:** force between electric charges, Coulomb's law, electric field arising from different charge distribution, electric flux and electric flux density, Gauss' law, divergence theorem, electrostatic potential, gradient of potential, electric dipole, Laplace's and Poisson's equations, stored energy and capacitors. **Stationary magnetic fields:** magnetic flux and flux density- Ampere' law- magnetic field intensity- inductance- magnetic circuit- curl of a vector – curl of magnetic field- divergence of magnetic flux density- Stoke' theorem- magnetic field energy- magnetic materials.
Prerequisite (s)	EMP214
Textbook	William Hayat, and John Buck, "Engineering Electromagnetics", McGraw Hill, 2005.
Lab./Computer work/Project	-

EED332	Digital Signal Processing 3 CH (2,1,1)
Course Contents	Sampling and Reconstruction of continuous time signals. Discrete time convolution, Z-transforms: Transfer functions, Analysis, Properties, and System stability. The Discrete Fourier transform: Analysis, Properties, Computer evaluation of Discrete Fourier Transform and Inverse Discrete Fourier Transform. Circular convolution, and Overlap-Add and Overlap-Save Filtering. The Fast Fourier transform. Decomposition in frequency. Multi-rate signal processing (decimation and interpolation). Infinite Impulse Response and Finite Impulse Response digital filters design.
Prerequisite (s)	EED231
Textbook	Alan V. Oppenheim & Ronald W. Schafer, "Discrete-Time Signal Processing", Prentice-Hall, Signal Processing Series, recent edition.
Lab./Computer work/Project	**Exp. 1:** Sampling and Quantization. **Exp. 2:** Fast Fourier Transform. **Exp. 3:** FIR filters. **Exp. 4:** Audio Effects. **Course Project:** Conduct the simulation activities that the instructor suggested with regard to the course's topics.

EED333	Electromagnetic Waves 3 CH (2,2,0)
Course Contents	Lumped and distributed elements circuits. Characteristics of the TL. Wave reflection, Input impedance and transmission. Voltage Standing Wave Ratio (VSWR). The Smith chart applications. Single stub line matching on Smith chart. Time harmonic wave equation. The wave equation (time harmonic, general medium). Polarization of electromagnetic waves. The reflection coefficient. Brewster angle for the vertical polarized waves. Atmospheric refraction of electromagnetic waves. Standard parameters of the troposphere. The refractive index. Health and safety standards. The wave propagation on a lossy and lossless TL.
Prerequisite (s)	EED331
Textbook	William Hayat, and John Buck, "Engineering Electro Magnetics", Mc-Graw Hill, recent edition.
Lab./Computer work/Project	Matching Using Smith Chart.

EED335	Analog Communication Systems 3 CH (2,2,1)
Course Contents	Analog communication systems: Block diagram, Transmission media, Frequency bands, Channel capacity and Data rate. Energy and power spectral densities (internal and external noise sources, noise figure, noise temperature, composite noise figure and composite noise temperature). Linear and nonlinear distortion. Link budget analysis. Amplitude modulation and demodulation (AM, SSB, DSB and VSB). Angle modulation and demodulation (PM and FM). FDM Systems. Broadcasting transmitters and receivers (AM, SSB, and FM). Automatic Gain Control (AGC). Automatic frequency control (AFC).
Prerequisite (s)	EED231
Textbook	B.P Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press, recent edition.
Lab./Computer work/Project	**Exp. 1:** Modulation and Coding Principles, kit familiarization. **Exp. 2:** Amplitude Modulation waveforms and spectrum demo. **Exp. 3:** Modulation index measurements using waveform and spectrum of a modulated signal. **Exp.** 4: FM spectrum, tone modulation, the effect of modulating frequency f_m and modulation index β **Exp. 5:** AM radio transmitter and receiver demo and signal inspection. **Exp. 6**: Implementation of analog communication System using MATEXP.

EED336	Digital Communication Systems 3 CH (2,2,1)
Course Contents	Introduction. Sampling theorem. Pulse modulation. Analog to Digital Convertors: PCM, DPCM, ADPCM, and DM. Sampling. Quantization and Encoding. Signal to Quantization Noise Ratio. TDM (principles, framing bits, synchronization and signaling, total bit rate). Line Codes: Pulse shaping. Inter symbol interference ISI. Nyquist First Criterion. Introduction to Information Theory. Detection of Binary signals in Gaussian noise. Matched filter. Correlation realization of a matched filter. Digital Receivers, and Regenerative repeaters. Equalizers. Time Extraction. Error Probability Performance for binary systems.
Prerequisite (s)	EED335
Textbook	Bernard Sklar, "Digital Communication fundamentals and Applications", Prentice Hall PTR, recent edition. **Reference Book:** B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press, recent edition.
Lab./Computer work/Project	Exp. 1: Sampling and TDM. Exp. 2: Digital Modulation formats (ASK, FSK, PSK). Exp. 3: PCM.

	Exp. 4: Line Coding. Exp. 5: Implementation of digital communication System using MATEXP.

EED337	**Digital Image Processing 3 CH (2,1,1)**
Course Contents	Z transform, different equations. Recursive computability. 2D: DFT, FFT, FIR filter design. Human eye: Perception, Psychophysical vision properties, Photometry and colorimetry. Optics and image systems. Image compression: Scalar quantization, Lossless coding, Huffman coding, Arithmetic coding dictionary techniques, waveform and transform coding DCT, KLT, Hadammard, Multiresolution coding pyramid, Subband coding, Fractal coding, Vector quantization. Geometry of image formation; basic concepts in image processing such as smoothing, edge and feature detection, color, and texture; segmentation.
Prerequisite (s)	EED231
Textbook	R. C. Gonzalez and R. E. Woods, Digital Image Processing, Prentice Hall, 4th Edition.
Lab./Computer work/Project	Selected Projects from the textbook.

EED344	**Electrical Power Engineering 3 CH (2,2,0)**
Course Contents	Composition of Electrical Power Systems: generation, transmission, sub-transmission, distribution and loads. Single-Line Diagram. Load characteristics: daily load curve, load duration curve, maximum and average loads, load, capacity, utilization, and diversity factors. Economics of power generation: fixed cost, depreciation, running cost, selection of of power sources of lowest cost. Tariffs: flat rate, two-part, block-rate. Power factor improvement: most economical power factor, capacitor sizing. Per-Unit system. Fault analysis: System modeling under fault conditions, Symmetrical faults. Circuit breakers and switchgear.
Prerequisite (s)	EED212
Textbook	- Gupta, B R, "Generation of Electrical Energy", Seventh Edition, New Dwlhi : S. Chand Publishing, 2017. - Hadi Saadat, "Power System Analysis", Third edition, PSA publishing, 2011.
Lab./Computer work/Project	N/A

EED345	**Electrical Power Transmission & Distribution 3 CH (2,2,0)**
Course Contents	Transmission Systems: Different types of transmission systems, Economics of transmission systems. Electric parameters of transmission lines: Series resistance, Series inductance, Shunt capacitance. Models of transmission lines: Representation of short, medium and long transmission lines. Performance of Transmission lines: Voltage and current relations, Voltage regulation, Power calculation for the sending and receiving ends, Efficiency of transmission lines. Loadability of transmission line based on thermal, stability, and voltage drop limits. Layout of distribution systems.
Prerequisite (s)	EED212
Textbook	- J. Glover, M. Sarma, T. Overbye, "Power System Analysis and Design", 5th Edition, Cengage Learning, 2012. - v.k.mehta & rohit Mehta, "principles of power system", 4th Edition, S.Chand Publications, 2008
Lab./Computer	N/A

EED346	High Voltage Engineering 3 CH (2,2,0)

Course Contents	Introduction. Generation and measurement of high voltage for testing: Generation of sinusoidal waves, Impulse generators, Specifications of high voltage laboratories. Insulators for transmission lines and substations. Insulator materials: Shapes and types, Factors affecting performance of insulators, Destructive and non-destructive insulation tests. Electrical breakdown in gases. Electrical breakdown in liquids and solids. Corona discharge. Single and three-core cables: Electrical stresses in cables, Equivalent circuits, High voltage cables, Thermal properties of cables. Earthing system: Soil resistivity, Ground resistance measurement.
Prerequisite (s)	EED212
Textbook	E. Kuffel, W.S. Zaengl, J. Kuffel, “High Voltage Engineering Fundamentals”, Second edition, Newnes, 2000.
Lab./Computer work/Project	A course paper on one of the contemporary technologies and/or approaches relevant to the course topics is to be prepared by the student

EED351	**Power Electronics 1 3 CH (2,2,1)**
Course Contents	Introduction and Classification of power-electronics converters (AC-DC, DC-AC, DC-DC, and AC-AC). Characteristics of power electronics switches: diodes, Thyristors (SCRs, and Triacs), BJTs, MOSFETs, and IGBTs, Wide Band Gap (WBG) switching devices. Power computation: Non-sinusoidal Source and Linear Load, and Sinusoidal Source and Nonlinear Load. Rectifier circuits: Uncontrolled, and controlled single-phase rectifier circuits with resistive, resistive-inductive, and R-L-E load. Single phase rectifier circuits with free-wheeling diodes, Uncontrolled, and Controlled three-phase rectifier circuits with R, R-L and R-L-E load.
Prerequisite (s)	EED213
Textbook	D. W. Hart, **“**Power Electronics”, 1st edition, McGraw Hill, 2011.
Lab./Computer work/Project	Exp. 1. Single Phase Rectifiers. Exp. 2. Three Phase Rectifiers.

EED352	**DC & Synchronous Machines 3 CH (2,2,1)**
Course Contents	Magnetic systems: Simple systems, Complex systems. DC Machine: Construction. DC Generator: EMF equation, Equivalent circuit, Load characteristics, Efficiency, and testing. DC Motors: Torque equation, Equivalent circuit, Load characteristics, Efficiency, Testing, Starting and speed control. 3-ph Synchronous Generators: Stator Design. Types of rotors, EMF equation, winding factor. Equivalent circuit, Characteristics and testing. Voltage regulation methods. Power angle (P-δ) characteristics. Loading conditions. 3-ph Synchronous Motor: Equivalent circuit, loading conditions. 3-ph Salient Generators: Equivalent circuit. Power angle (P-δ) characteristics.
Prerequisite (s)	EED212
Textbook	Chapman, S. J., “Electric Machinery fundamentals”, McGraw Hill Co., 4th edition, 2005.
Lab./Computer work/Project	**Exp. 1**: Characteristics of a separately excited DC generator. **Exp. 2**: Characteristics of a DC shunt motor. **Exp. 3**: Determination of the equivalent circuit parameters of a 3-phase synchronous machine. **Exp. 4**: Characteristics of a 3-phase alternator.

EED353	**Transformers & Induction Machines 3 CH (2,2,1)**
Course Contents	**Single-phase transformers:** Construction, Ideal transformer, Electro-Magnetic Field (EMF) equation, Single-phase transformer equivalent circuits. Efficiency and voltage regulation. Open -circuit and short-circuit tests. Parallel operation. **3-phase Transformers**

	and **Autotransformers**: Construction, theory of operation, Equivalent circuit. **3-phase Induction Motors:** Construction, Theory of operation, Equivalent circuit, power and torque equations, Load characteristics, Modes of operations, Testing, Starting methods, Speed control. Double cage Induction Motor.
Prerequisite (s)	EED212
Textbook	Chapman, S. J., "Electric Machinery fundamentals", McGraw Hill Co., 4th edition, 2005.
Lab./Computer work/Project	**Exp. 1**: Determination of the equivalent circuit parameters of a 1-phase transformer. **Exp. 2**: Characteristics of a single-phase transformer. **Exp. 3**: Characteristics of a 3-phase squirrel-cage IM. **Exp. 4**: Characteristics of a 3-phase Slip-ring IM.

EED355	**Control Systems** 3 CH (2,2,0)
Course Contents	Introduction to feedback control systems. Modeling of dynamic systems. Transfer function. Block diagram reduction. Steady-state error. Transient response analysis: maximum overshoot, settling time, rise time and peak time. System stability and Routh's criterion. Root-Locus analysis: asymptotes, breakaway/breakin points, angles of departure/arrival. Design of PID controller using root-locus. Frequency response analysis techniques. Bode diagrams: Magnitude and Phase diagrams. Design of series compensators using Bode Diagrams. Applications using MATLAB.
Prerequisite (s)	EMP214
Textbook	Katsuhiko Ogata, "Modern Control Engineering", 5th Edition, Pearson, 2010.
Lab./Computer work/Project	**Exp. 1:** Feedback control systems. **Project**: MATLAB-based design of a PID controller for a dynamic system under assigned specifications

EED362	**Data Structures and Algorithms** 3 CH (2,1,2)
Course Contents	**Algorithms:** Analyzing algorithms, Designing algorithms, Probabilistic Analysis and Randomized Algorithms. Sorting in Linear Time. Medians and Order Statistics. **Elementary Data Structures**: Stacks and queues, Linked lists, Implementing pointers and objects. **Hash Tables:** Direct-address tables, Hash tables, Hash functions. **Binary Search Trees**: Querying a binary search tree, Insertion and deletion, randomly built binary search trees. **Red-Black Trees**: Rotations, Insertion, Deletion. **Augmenting Data Structures:** Dynamic order statistics, Interval trees.
Prerequisite (s)	EED161
Textbook	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", 3rd Edition, ISBN-13: 978-0262033848.
Lab./Computer work/Project	**Exp. 1:** Setup: Setting Up Your Computer. **Exp. 2**: JUnit Tests and Debugging. **Exp. 3:** Timing Tests and Randomized Comparison Tests. **Exp. 4:** Git and Debugging. **Exp. 5:** BSTMap and HashMap.

EED363	**Operating Systems** 3 CH (2,1,1)
Course Contents	Basic concepts of operating systems and system programming: Utility programs, Subsystems, Multiple-program systems. Processes. Inter-process communication, and synchronization. Memory allocation. Segmentation. Paging. Loading and linking. Libraries. Resource allocation. Scheduling. Performance evaluation. File systems. Storage devices, I/O systems. Protection, security, and privacy.
Prerequisite (s)	EED223
Textbook	Avi Silberschatz, Peter Baer Galvin, and Greg Gagne, "Operating System Concepts", 9th

	Edition, 2012.
Lab./Computer	--

EED364	**Database Management Systems** **3 CH (2,2,1)**
Course Contents	Access methods and file systems to facilitate data access. Hierarchical, network. Relational and object-oriented data models. Query languages for models. Embedding query languages in programming languages. Database services: Protection, Integrity control, and Alternative views of data. High-level interfaces: Application generators, Browsers, and Report writers. Introduction to transaction processing. Database system implementation to be done as term project.
Prerequisite (s)	EED362
Textbook	C.J. Date, "An Introduction to Database Systems", 8th Edition, ISBN-13: 978-0321197849
Lab./Computer	--

EED371	**Artificial Intelligence** **3 CH (2,1,1)**
Course Contents	**Search Algorithms:** Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. **Search in Complex Environments:** Local Search and Optimization Problems, Local Search in Continuous Spaces, Search with Nondeterministic Actions. **Adversarial Search and Games,** Game Theory, Optimal Decisions in Games, Heuristic Alpha–Beta Tree Search. **Knowledge, reasoning, and planning:** Logical Agents, Knowledge-Based Agents. **First-Order Logic:** Syntax and Semantics of First-Order Logic, Using First-Order Logic. **Inference in First-Order Logic:** Propositional vs. First-Order Inference, Forward Chaining, Backward Chaining.
Prerequisite (s)	EED261 & EMP216
Textbook	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, 2020.
Lab./Computer work/Project	**Exp. 1:** UNIX/Python Tutorial. **Exp. 2:** Implementation of depth-first, breadth-first, uniform cost, and A* search algorithms. **Exp. 3:** Implementation of multiagent minimax and expectimax algorithms **Exp. 4:** logical inference to solve planning tasks as well as localization, mapping, and SLAM. **Project:** Applying an array of AI techniques to playing Pac-Man.

EED372	**Machine Learning** **3 CH (2,1,2)**
Course Contents	Introduction to Machine Learning: Concepts, Instances, Attributes, Simple Examples, Application Domains. Machine Learning and Statistics. Data Pre-processing and Exploration: Sampling, Feature Extraction. Statistical and structural pattern recognition approaches. Bayesian decision theory. Maximum-Likelihood and Bayesian parameter estimation. Nearest neighbor rule. Non-parametric classifiers. Linear discriminate functions. Non-linear classifiers. Multi-layer neural networks. Features selection. Unsupervised learning and Cluster analysis. Supervised learning. Soft computing paradigms: Fuzzy systems and Evolutionary computation.
Prerequisite (s)	EMP115
Textbook	Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, "An Introduction to Statistical Learning with Applications" Springer, New York, 2013. ISBN # 978-1-4614-7137-0.
Lab./Computer work/Project	**Exp. 1:** Google Cloud Compute Jupyter Exp. setup guide. **Exp. 2:** CoExp. GPU Acceleration Setup Guide.

EED374	**Machine Learning and Pattern Recognition 3 CH (2,1,2)**
Course Contents	Fundamental concepts for machine learning and pattern recognition: Concepts, Instances, Attributes, Simple Examples, Application Domains. Machine Learning and Statistics. Bayesian decision theory, Parametric and non-parametric learning, and Classifier strategies. Clustering Techniques, and statistical and structural pattern recognition approaches. Data reduction, Support Vector Machines (SVMs), and deep learning with neural networks. Features selection, and Template matching. Unsupervised learning and Cluster analysis. Supervised learning. Applications areas: Computer vision, and Speech recognition.
Prerequisite (s)	EMP115
Textbook	Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, "An Introduction to Statistical Learning with Applications" Springer, New York, 2013. ISBN # 978-1-4614-7137-0.
Lab./Computer work/Project	**Exp. 1:** Google Cloud Compute Jupyter Exp. setup guide. **Exp. 2:** CoExp. GPU Acceleration Setup Guide.

EED381	**Data Communication 3 CH (2,1,2)**
Course Contents	Analog communication systems: Amplitude modulation and demodulation; Angle modulation and demodulation. Digital communication: Pulse modulation; TDM; Line Codes; Error Probability Performance for binary systems. Basics of data communications and computer networks. Timing diagrams and calculation of total delay. Addressing in computer networks: Port; MAC and IP address of IPv4 and IPv6. Network layered models: 7-Layers and 5-layers models. Protocols in TCP/IP models. Error control. Examples: LAN, WLAN, …etc.
Prerequisite (s)	EED231
Textbook	B.P Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press, recent edition. Behrouz Frouzan, "Data communications and Networking", McGraw-Hill, recent edition.
Lab./Computer work/Project	Exp. 1: Amplitude Modulation waveforms and spectrum demo. Exp. 2: Analog and Digital Modulation formats. Exp. 3: Line Coding. Exp. 4: Identifying the important Windows networking utilities. Exp. 5: Packet sniffing. Exp. 6: Address Resolution Protocol (ARP). Exp. 7: Internet Protocol.

EED411	**Electronic-Circuits for Communication 3 CH (2,2,1)**
Course Contents	Analysis and design of electronic circuits for communication systems. Voltage multipliers: Structure, Phase detectors and AM modulators. Active filters: Design techniques, Filter realization of the RLC filter, First- and second-order RC section, Positive and negative feedback topologies. The inductor simulation. Frequency-dependent negative resistance. Power amplifier design and applications: Classifications, Classes A, B and AB, and conversion efficiency. Sinusoidal Oscillators: RC, LC, Crystal, Ring, and Voltage Controlled Oscillators. Introduction to Phase-Locked Loop.
Prerequisite (s)	EED311
Textbook	Frank R. Dungan, "Electronic Communications Systems", PWS Publishers, recent edition.
Lab./Computer work/Project	**Exp. 1:** Analyzing Gilbert cell. **Exp. 2:** Simulating different types of filters. **Exp. 3:** Simulating different types of Oscillators **Project Work:** Design of communication systems formed from two (or several)

	transmitters and tuneable receiver. The results might be verified using PSpice simulation.

EED412	**Analog Integrated Circuits 3 CH (2,2,1)**
Course Contents	Revision of CMOS processing technology and device characteristics. Layout & Matching Techniques. Transistor models in high frequency. Current mirrors. Single-ended amplifiers. Differential amplifiers. Operational amplifiers. Frequency response. Feedback theory. Stability analysis. Circuit non-idealities and noise. Output stages. Digital to Analogue and Analogue to Digital Converters. Computer Aided Design (CAD) tools for circuit analysis and design.
Prerequisite (s)	EED311
Textbook	Behzad Razavi, "Design of Analog CMOS Integrated Circuits," McGraw-Hill, recent edition.
Lab./Computer work/Project	**Exp. 1:** CAD tool familiarization. **Exp. 2:** Single-ended amplifier simulation and layout. **Exp. 3:** Differential amplifier simulation and layout. **Project Work:** Using CAD tool to analyze and design of more advanced analog building block.

EED422	**Real-time Embedded Systems 3 CH (2,0,3)**
Course Contents	This course introduces students: Basics of models, Analysis tools, and Control for embedded systems operating in real time. Students learn how to combine physical processes with computation. Topics include: Models of computation, Control, Analysis and verification, interfacing with the physical world, Mapping to platforms, and Distributed embedded systems. The course has a strong Exploratory component with emphasis on a semester-long sequence of projects.
Prerequisite (s)	EED323
Textbook	E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems- A Cyber-Physical Systems Approach, Second Edition", 2nd Edition, 2015. References Book: Chapman, S. J., “Electric Machinery fundamentals”, McGraw Hill, 4th edition, 2005.
Lab./Computer work/Project	Integrating several assignments/experiments and projects in the applications of the Real-time Embedded Systems.

EED434	**Microwave Engineering 3 CH (2,2,1)**
Course Contents	Basic equations of uniform waveguides: Planar (rectangular cross section, circular c.s., and coaxial guide). TE and TM field configuration and modes for all previous guides and dominant mode. Power transmitted and attenuation. Dielectric waveguides and ridged waveguides. Properties of general cavity resonator. Resonance frequency of rectangular cavity resonator and cylindrical cavity resonator. The quality factor. Dielectric cavity resonator. Microwave networks. Scattering matrices for several junctions (Tee junction and magic Tee). Microwave filters (different types). Insertion loss solution.
Prerequisite (s)	EED333
Textbook	David Pozar, "Microwave Engineering", J.Wiley, recent edition.
Lab./Computer work/Project	As advised.

EED435	**Antenna and Propagation 3 CH (2,2,1)**
Course Contents	Fundamental antenna parameters. Radiation pattern. Main and minor lobes. Field regions. Directivity, Gain, H.P.B.W, F.N.B.W. Polarization, Effective aperture. The transmission

	equation and the link budget. Infinitesimal antenna. Wire antenna: Dipole- monopole, Loop antenna, Travelling wave antenna. Microstrip antennas. Aperture antenna. Rectangular aperture. Circular aperture. Electromagnetic horns. Array antennas. Phase scanning array. Broadband antenna. Helical antenna. Reflector antennas. Parabolic reflector antenna. Double reflector antennas. Cassegrain antenna. Gregorian antenna. Electromagnetic waves Health and Safety standards.
Prerequisite (s)	EED333
Textbook	Constantine Balanise, "Antenna Theory Analysis & Design", John Willy & Sons, recent edition.
Lab./Computer work/Project	**Exp. 1**: Measurements of antenna Radiation Pattern. **Exp. 2**: Measurement of antenna HPBW, FNBW, SLL.

EED439	**Introduction to Information Theory** **3 CH (2,1,1)**
Course Contents	Introduction: uncertainty, information, entropy and its properties, Source coding: Shannon coding, prefix coding, Kraft-Mcmillan inequality, First Shannon theorem, Huffman coding, Lempel Ziv coding, Discrete memoryless channels: transition probability, binary symmetric channel, Mutual information and its properties, Channel capacity, Definition, Binary symmetric channel. Channel coding theorem: second Shannon theorem differential entropy and mutual information for continuous ensembles, Channel capacity theorem: implications on different communication systems, Constant rate encoding, Linear encoding, Error Control: error detection algorithms, error correction algorithms.
Prerequisite (s)	EED336 & EMP115
Textbook	Digital communication, Simon Haykin, John Wiley, 2003. Thomas M. Cover, Joy A. Thomas "Elements of Information Theory" 2nd Edition. Digital Communications - Glover and Grant; Pearson Ed. 2nd Ed 2008. Shu Lin, Daniel J. Costelo, "Error control coding: Fundamentals and applications", Prentice-Hall, 1983.
Lab./Computer work/Project	**Exp. 1:** Shannon coding and decoding. **Exp. 2:** Shannon-Fano coding and decoding. **Exp. 3:** Huffman coding and decoding. **Exp. 4:** Lempel-Ziv coding and decoding. **Exp. 5:** Hamming coding and decoding. **Exp. 6:** Convolutional coding and decoding**.**

EED441	**Renewable Energy** **3 CH (2,2,1)**
Course Contents	Renewable energy resources. Wind Energy Conversion System: Power in the wind, Power extracted by turbine blades, Wind turbine power curve, Estimation of annual energy, Types of grid connected wind turbines, Environmental impacts of wind turbines. Photovoltaic Systems: The solar resource, Estimation of irradiance and radiation, The photovoltaic effect, Electric characteristics of solar cells, Types of solar cells, Modules and arrays, Mismatch in connected cells, Stand-alone PV systems, Grid connected PV systems, Estimation of annual energy.
Prerequisite (s)	EED212
Textbook	Gilbert M. Masters, "Renewable and Efficient Electric Power Systems", 2nd Edition, August 2013, Wiley-IEEE Press.
Lab./Computer work/Project	**Exp. 1:** Operation of Wind Energy Conversion Systems. **Exp. 2:** Photovoltaic Systems: Characteristics and Operation.

EED443	**Power System Protection** **3 CH (2,2,1)**

Course Contents	Fundamentals of power system protection: Requirements of protection, Dependability, Security, Selectivity, Sensitivity, Speed, Zones of protection, Backup concept, Coordination concept. Voltage transformer, CCVT, Current transformers (CT): Equivalent circuit, Error calculation, IEC CT class. Overcurrent relays: Characteristics, Current setting, Time setting. Radial system protection, Coordination of overcurrent relays, Reclosers and fuses. Distance relay: Impedance, Directional impedance, Mho and Quadrilateral relays. Distance protection of Lines. Differential Relay, Differential protection of Transformers, Buses and Rotating machines.
Prerequisite (s)	EED344
Textbook	. J. Duncan Glover, Mulukutla S. Sarma, Thomas J. Overbye, " Power System Analysis and Design", Fifth edition, Cengage Learning, 2012. U.A. Bakshi, M.V. Bakshi, "Protection and Switchgear", Technical Publications, 2009.
Lab./Computer work/Project	Overcurrent Relay Line Protection with OC Relays' Coordination. Directional Overcurrent Relay. Differential Protection of Transformers. **Course Paper**: Selected contemporary protection topic.

EED446	**Power System Analysis 1** **3 CH (2,2,0)**
Course Contents	Power System Modeling: Per unit system, Bus admittance and bus impedance matrices. Power flow: Problem description, Gauss-Seidel method, Newton-Raphson method, Fast decoupled solution. Fault analysis: System modeling under fault conditions, Symmetrical faults, Fault calculation using Z-bus. Symmetrical components: Definition, Sequence networks of loads, Sequence networks of series impedances, Sequence networks of machines, Sequence networks of transformers. Unsymmetrical faults: System representation, Single-Line to Ground fault, Line-Line Fault, Line-Line-Ground Fault. Computer solution of power flow using Power World Simulator and MATLAB.
Prerequisite (s)	EED344
Textbook	Hadi Saadat, “Power System Analysis”, Third edition, PSA publishing, 2011.
Lab./Computer work/Project	N/A

EED447	**Power System Analysis 2** **3 CH (2,2,0)**
Course Contents	Fundamentals of power system stability: Types of stability, Swing equation, Equivalent circuits of power system elements. Small signal stability: Synchronizing and damping coefficients, Solution for second order system. Transient stability: Equal area criterion, Application to sudden change in load, Application to three-phase fault, Critical clearing angle. Numerical solution of swing equation: Euler and modified Euler methods. Voltage stability: Single-load infinite-bus system, Maximum deliverable power, PV curves, Reactive power requirement, Effect of VAR compensation, VQ curves.
Prerequisite (s)	EED344
Textbook	Hadi Saadat, “Power System Analysis”, Third edition, PSA publishing, 2011.
Lab./Computer	--

EED451	**Power Electronics 2** **3 CH (2,2,1)**
Course Contents	Single-phase AC voltage controllers: ON-OFF controller, phase-angle controller with resistive and with resistive-inductive load. Three-phase AC-AC voltage controller with resistive load (Y- and Δ-connected load). DC Choppers with R-L-E load with CCM and DCM operation. Analysis and Design of DC-DC voltage regulators: Buck, Boost, Buck-Boost, Ćuk

	converters. Inverters: Single-phase square-wave inverters with R-L load, analysis and design of single-phase inverter with unipolar sine pulse width modulated scheme and with bipolar sine pulse width modulated scheme, three- phase six-step inverters.
Prerequisite (s)	EED351
Textbook	D. W. Hart, "Power Electronics", 1st edition, McGraw Hill, 2011.
Lab./Computer work/Project	**Exp. 1**. Phase Angle Control AC Voltage Controller. **Exp. 2**. Step Down DC- DC voltage Converter.

EED454	**Electric Motor Drives 3 CH (2,2,0)**
Course Contents	Components of modern Electric drives system, Mechanical equation of motion, Characteristics of mechanical loads and electrical motors, Quadrant operations, Criteria for selecting drive components. DC Drives: speed control using controlled rectifiers, Speed control using DC choppers. AC Drives: stator voltage control, stator frequency control, V/f control. Switched reluctance motor drives. Brushless DC Motor Drives. Permanent Magnetic Brush-Less DC Motor Drives. Vector controlled drives.
Prerequisite (s)	EED451
Textbook	Muhammad H. Rashid, "Power Electronics: Circuits, Devices & Applications", 4th Ed., Pearson; 2014
Lab./Computer work/Project	**Exp. 1.** Speed Control of DC Motor Using DC Chopper. **Exp. 2.** Speed Control of Three Phase Induction Motor.

EED462	**Software Engineering 3 CH (2,1,1)**
Course Contents	Fundamental concepts of software engineering. Software processes lifecycle. Software process models: Waterfall model, Transformation model, Spiral model, Evolutionary model. Software requirements: User and system requirements, Functional and non-functional requirements. Requirements analysis, modeling, negotiation, and validation. Software Requirements Specification (SRS) document. Data flow modeling and Data Flow Diagram (DFD). Object-oriented concepts. Unified Modeling Language (UML). Object-oriented analysis and design. Software architecture. Software design. User interface design. Software testing. Software prototyping. Component Based Software Engineering (CBSE). Software maintenance. Software cost estimation.
Prerequisite (s)	EED362
Textbook	Robert Martin, "Clean Code: A Handbook of Agile Software Craftsmanship", 1st Ed., 2008.
Lab./Computer work/Project	-

EED475	**Fundamentals of Deep Learning 3 CH (2,2,1)**
Course Contents	Introduction to deep learning and its underlying theory. The range of applications to which it has been applied. Architectures commonly associated with deep learning: Basic neural networks, Convolutional neural networks, and Recurrent neural networks. Methods to train and optimize the architectures and methods to perform effective inference.
Prerequisite (s)	EED372
Textbook	Nikhil Buduma and Nicholas Locascio, " Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms ".
Lab./Computer work/Project	Exp. 1: Python Basics with Numpy. Exp. 2: Logistic Regression with a neural network mindset. Exp. 3: Building your Deep Neural Network: step by step. Exp. 4: Deep Neural Network – Application Exp. 5: Initialization and Regularization of Deep Neural Network.

	Exp. 6: Gradient Checking and Optimization of Deep Neural network.

EED483	Introduction to Data Security 3 CH (2,2,1)
Course Contents	This is an introductory course on methods, algorithms, techniques, and tools of data security and cryptography. After studying the theoretical aspects of cryptographic algorithms and protocols, we show how these techniques can be integrated to solve particular data and communication security problems. This course material is of use to computer and communication engineers who are interested in embedding security into an information system, and thus, providing integrity, confidentiality, and authenticity of the documents and the communicating parties.
Prerequisite (s)	EED261, EED381
Textbook	W. Stallings, "Network Security Essentials: Applications and Standards",6th Ed, Pearson, 2017.
Lab./Computer	--

EED484	Wireless Communication 3 CH (2,1,1)
Course Contents	Overview of Wireless Communications, Path Loss and Shadowing Models, General Ray Tracing, Millimeter wave propagation, Statistical Multipath Channel Models, Narrowband and Wideband Fading Models, Capacity and coding for Wireless Channels, Digital Modulation and its Performance, Signal Space Analysis, Passband Modulation Principles, Diversity, Adaptive Modulation, Multiple Input/Output Systems (MIMO), Multicarrier Systems, Orthogonal Frequency-Division Multiplexing (OFDM), Multiuser and Cellular Systems.
Prerequisite (s)	EED336
Textbook	Andrea Goldsmith, "Wireless Communications" , 2nd edition, 2020.
Lab./Computer work/Project	**Exp. 1:** Simulation for Cahnnel model and Capacity. **Exp. 2:** Simulation of digital modulation techniques. **Exp. 3:** Simulation of channel coding and decoding techniques. **Exp. 4:** Simulation of MIMO system.

EED485	Satellite Communication 3 CH (2,1,1)
Course Contents	Satellite services and frequency allocations. Satellite orbits. Kepler's laws. Orbital parameters and terms. Effect of non-spherical Earth shape. Regression of Nodes. Rotation of absides. Atmospheric drag. Geostationary and non-geostationary satellites. Space dynamics and orbitography. Calendars and times. Tracking angles. The satellite subsystems, P/L, TCR, EPS, ADCS. The design of satellite communication links. Features and advantages of satellite communications, and the station keeping maneuvers. The satellite ground stations. Power Budget calculations. GCS Cassegrain Antenna system. Available Bit rate.
Prerequisite (s)	EED335
Textbook	Dennis Roddy, "Satellite Communications", McGraw Hill, recent edition.
Lab./Computer	As advised.

EED486	Optical Fiber Communication Systems 3 CH (2,1,1)
Course Contents	Introduction. Optical Fiber waveguides (structure and types). Ray theory transmission. Electromagnetic mode theory for optical propagation. Optical Fiber waveguides. Step index fiber, and graded index fiber. Single mode fiber parameters. Transmission Characteristics of optical fibers. Nonlinear effects, Optical fiber cables, Optical fiber connections, Direct detection receiver performance, Receiver noise, and Receiver structure. Optical fiber

	systems (direct detection): Digital system design considerations, Optical power budget, and Rise time budget. Fiber amplifiers and WDM techniques, and Optical fiber parameters measurements.
Prerequisite (s)	EED335
Textbook	John Senior, "Optical Fiber Communications: Principles and Practice", Prentice Hall, recent edition.
Lab./Computer work/Project	**Exp. 1:** Optical fiber connections: joints, couplers and isolators. **Exp. 2:** Familiarization of EDFA. **Exp. 3:** Internal modulation of a LED. **Exp. 4:** Performing Splicing of fibers using the splicing machine. **Exp. 5:** Familiarization and application of OTDR.

EED487	**Modelling and Analysis of Telecommunication 3 CH (2,1,1)**
Course Contents	**Performance Evaluation in Telecommunications:** Queueing Models, Computational Tools. **Probability and Random Processes Review:** Basic Relations, Random Variables—Probability Distributions and Densities, Joint Distributions of Random Variables, Linear Transformations, Transformed Distributions, Inequalities and Bounds, Markov Chains, Random Processes. **Queueing Theory:** Elements of the Queueing Model, Little’s Formula, Poisson Process, Birth and Death Processes: Application to Queueing, Method of Stages. **Networks of Queues:** Jackson Networks, Reversibility: Burke’s Theorem, Feedforward Networks, Closed Jackson Networks, BCMP Networks.
Prerequisite (s)	EED336
Textbook	Jeremiah F. Hayes and Thimma V. J. Ganesh Babu, "Modeling and Analysis of Telecommunications Networks", John Wiley & Sons, ISBN-13: 978-0471348450, 2004.
Lab./Computer	As advised.

EED488	**Computer Networks 3 CH (2,2,1)**
Course Contents	The course introduces main concepts of networking, application areas, classification, reference models, transmission environment, technologies, routing algorithms; IP, UDP and TCP protocols, reliable data transferring methods, application protocols, management systems. The topics include: Network applications, hardware, and software; reference models: OSI, TCP/IP, Internet; Network Layer: design issues, routing algorithms, Congestion control algorithms; Transport Layer: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols; Application Layer: Domain name system, electronic mail, World Wide Web; Application Layer Protocols
Prerequisite (s)	EED381
Textbook	Behrouz Frouzan, "Data communications and Networking", McGraw-Hill, recent edition.
Lab./Computer work/Project	**Exp. 1:** Identifying the important Windows networking utilities. **Exp. 2:** Packet sniffing. **Exp. 3:** Address Resolution Protocol (ARP). **Exp. 4:** Internet Protocol.

EED489	**Data Communication and Computer Networks 3 CH (2,1,1)**
Course Contents	Basics of data communications and computer networks. Timing diagrams and calculation of total delay (real and non-real time applications). Addressing in computer networks: Port, MAC and IP address (classful and classless) of IPv4 and IPv6. Network layered models: 7-Layers (ISO/OSI) and 5-layers (TCP/IP) models. Protocols in TCP/IP models. Error control: Linear block codes and Hamming distance, CRC error detecting codes. Local Area Networks: Wired (Ethernet) generations up to 100Giga Ethernet, Wireless LAN generations, IEEE802.11, ISM bands, Bluetooth, WiMax (IEEE802, 16).

Prerequisite (s)	EED336
Textbook	Behrouz Frouzan, "Data communications and Networking", McGraw-Hill, recent edition.
Lab./Computer work/Project	**Exp. 1:** Identifying the important Windows networking utilities. **Exp. 2:** Packet sniffing. **Exp. 3:** Address Resolution Protocol (ARP). **Exp. 4:** Internet Protocol.

EED496	**Selected Topics in Electronics Engineering 3 CH (2,1,1)**
Course Contents	This course covers a number of advanced topics in the field of electronics engineering.
Prerequisite (s)	As advised
Textbook	As advised
Lab./Computer	As advised

EED497	**Selected Topics in Communication Engineering 3 CH (2,1,1)**
Course Contents	This course covers a number of advanced topics in the field of communication engineering.
Prerequisite (s)	As advised
Textbook	As advised
Lab./Computer	As advised

EED498	**Graduation Project 1 2 CH (1,0,3)**
Course Contents	The Project requires application of engineering principles to the solution of a real-world problem based on the knowledge and skills acquired during the course work. At the end of the semester, the student should present a technical report including at least the following items: a survey on the project subject using the appropriate literature, a time schedule for the design and implementation phases of the project, and the work done to acquire the necessary skills, and knowledge. The student has to take into consideration the appropriate engineering standards and multiple constraints during the different phases of the project.
Prerequisite (s)	Completion of 100 Credit hours
Textbook	As advised.
Lab./Computer	As advised.

EED499	**Graduation Project 2 3 CH (1,0,6)**
Course Contents	This course represents the second part of the graduation project. It fulfills the deliverables stated in Graduation Project 1. The supervisor has to emphasize on the teamwork concept during the phases of the work. The jury members from academy and industry evaluate the student work based on a submitted documents and final product, oral presentation and discussion. In case the student failed in the project, he is given a chance for one more semester and will be eligible to present and defend the project by the end of that semester.
Prerequisite (s)	EED498
Textbook	As advised.
Lab./Computer	As advised.

EED413	**Microwave Devices 3 CH (2,1,1)**

Course Contents	**Vacuum tube devices**: The construction, Operation principles, Mathematical analysis, and Power calculation of the magnetron (crossed field tube), Klystron (velocity modulated tube), and the travelling wave tube. **Microwave Transistors and Tunnel Diodes:** Microwave Bipolar Transistors, Heterojunction Bipolar Transistors (HBTs), Microwave Tunnel Diodes. **Solid state devices**: The Gunn oscillator, The IMPATT (Impact Ionization Avalanche Transit Time) diode, and Microwave amplifier.
Prerequisite (s)	EED333
Textbook	Samuel Liao, "Microwave Devices and Circuits ", Pearson, recent edition.
Lab./Computer	As advised.

EED414	**RF Circuits and Systems 3 CH (2,1,1)**
Course Contents	Basic concepts: Harmonic and intermodulation distortion, Intercept point noise, Sensitivity and Dynamic range, Impedance matching. Low noise amplifiers (LNAs) and mixers: Bipolar and CMOS LNAs, Passive and active mixers, Noise in mixers, Image rejection. Oscillators: LC oscillator circuits, Phase noise, Bipolar and CMOS implementations, Generating quadrature pulse. Frequency synthesizers: Frequency synthesis PLLs, Frequency divider and Prescaler circuits. Power amplifiers: Efficiency vs. linearity, Linear PAs, Nonlinear PAs, Linearization methods. RF transceiver architectures: Heterodyne and direct conversion receivers, Transmitters.
Prerequisite (s)	EED311
Textbook	B. Razavi, "RF Microelectronics", Prentice-Hall, recent edition.
Lab./Computer work/Project	**Exp. 1:** LC oscillator **Exp. 2:** Power amplifiers **Project Work:** Design a specified CMOS receiver.

EED415	**VLSI Testing and Design for Testability 3 CH (2,1,1)**
Course Contents	Introduction to testing of digital electronic circuits and systems: Faults and fault modeling, Automatic test equipment (ATE), Automatic test pattern generation and Test compaction of combinational and sequential logic circuits. Fault simulation and its application to the fault diagnosis. Design for testability (full and partial internal scan, boundary scan, and logic-built-in self-test (LBIST)). Memory test techniques and memory-built-in self-test (MBIST). Delay test and at-speed test techniques. Introduction to the testing of analog and mixed-signal circuits.
Prerequisite (s)	EED313
Textbook	N. K. Jha and S. Gupta, "Testing of Digital Systems", Cambridge University Press, recent edition.
Lab./Computer work/Project	Integrating several assignments/experiments in the applications of the testing and design for testability in electronic circuits. **Exp. 1:** Design the test pattern generator to detect the asserted fault in the digital circuit. **Exp. 2:** Design the test response compactor to locate the asserted fault in the digital circuit. **Exp. 3:** Design the basic structure of the Boundary Scan Architecture.

EED416	**VLSI Design Automation 3 CH (2,1,1)**
Course Contents	VLSI (Very Large-Scale Integration) CAD Flow. Brief Exposition of Logic Synthesis and Technology Mapping, Chip Layout Styles. High-Level Synthesis. Algorithmic Approaches Commonly used for VLSI CAD Problems. VLSI and Circuit Design Issues: Power and delay analysis and minimization, Partitioning: Problem Definition and Approaches to Partitioning Problem, Floor-planning, Placement, Global and Detailed Routing.
Prerequisite (s)	EED313
Textbook	S.M. Sait and H. Youssef, "VLSI Physical Design Automation", World Scientific

	Publishing Company, recent edition.
Lab./Computer work/Project	**Exp. 1:** Placement and Routing. **Exp. 2:** Design issues. **Exp. 3:** Timing-Driven Partitioner. **Project Work:** Applications suggested by instructor.

EED417	**Optical Electronics 3 CH (2,1,1)**
Course Contents	Introduction. Photons and Electrons-Maxwell's equations. Wave nature of light, fundamentals of optics. Interaction of radiation and atomic systems. Particle/wave property. De-Broglie wavelength. Uncertainty principle-optical coherence and correlation. Radiation and solids. Light and matter (light propagation in uniform dielectric medium, Rayleigh scattering, susceptibility, optical dispersion). Rate equations and gain medium for two level system. Theory of laser oscillation: Fabry-Perot laser, Three-level system, and four level system. Optical Sources: Gas Laser, Nd-YAG Laser, and Semiconductor sources (LEDs and LDs). Optical Modulators. Photo detectors (PINs and APDs).
Prerequisite (s)	EMP227
Textbook	Alan Rogers, Chapman and Hall, "Essentials of optoelectronics with applications", McGraw Hill, recent edition.
Lab./Computer work/Project	**Exp. 1:** Numerical aperture (NA). **Exp. 2:** Snell's law. **Exp. 3:** FSR of a laser diode. **Exp. 4:** Polarization effect on detection. **Exp. 5:** Energy gap of a laser source. **Exp. 6:** DC characterization of Laser Diode (LD).

EED425	**Introduction to Robotics 3 CH (2,1,1)**
Course Contents	Robotics overview and applications. Homogeneous vector and plane. Homogeneous transformation. Position and orientation transformations. Forward and inverse kinematics of robots: frame representations, transformations, position and orientation analysis. Differential Motions and velocity analysis of robots and frames. Analysis of robot dynamics and forces: Lagrangian mechanics methods of path and trajectory planning, joint-space and in Cartesian-space. Actuators: hydraulic devices, DC servomotors and stepper motors, Pneumatic devices, novel actuators. Robot programming using standard software robotics tools (MATEXP). Implementation of the right industrial robotics system for a plant.
Prerequisite (s)	EED223
Textbook	Saeed Niku, "Introduction to Robotics: Analysis, Systems, Applications", Prentice Hall, recent edition
Lab./Computer work/Project	**Exp. 1:** Design and plan one-axis rotation, Euler-angle rotation. **Exp. 2:** Path planning of industrial robots. **Exp. 3:** Mobile robot path planning. **Project Work:** Robot programming using standard S/W robotics tools (MATEXP.) and implementation.

EED442	**Power Distribution Systems 3 CH (2,2,0)**
Course Contents	Fundamentals of Distribution Systems: Distribution system elements, Distribution system configurations, Primary Voltage Levels, Distribution Substations, Sub-transmission network. Approximate Methods of Analysis: Voltage Drop, Line Impedance, “K” Factors, Power loss, Uniformly distributed Loads, Lumping Loads in Geometric Configurations; Rectangle, Triangle, Trapezoid. Voltage Regulation: Voltage Standards, Regulation

	Techniques, Regulators (autotransformers), Line-Drop Compensation, Load-Center Compensation. Capacitor Application: Capacitor Ratings, Reducing Line Losses, Switched Banks, Local Controls, Automated Controls.
Prerequisite (s)	EED344
Textbook	Turan Gonen, " Electric Power Distribution Engineering, Third Edition, CRC Press, 2016.
Lab./Computer	N/A

EED445	**Switchgear and Substations 3 CH (2,2,0)**
Course Contents	Fundamentals of Switching Operations: Isolators, Break switches, Circuit breakers. Switching Operation: equivalent circuits, Arc formation and Extinction, Transient Recovery Voltage. Circuit Breakers (CBs) Technology: Oil, Vacuum, Air blast and SF6 CBs. Rated Characteristics of Circuit Breakers. Substation fundamentals: Substation components AIS versus GIS, circuit configuration: Single bus, Double bus single breaker, Ring bus, Breaker and a half. Dimensioning of switchgear installations and civil construction requirements. Substation grounding to meet step voltage, touch voltage regulations. Protection against lightning. Substation Automation.
Prerequisite (s)	EED344
Textbook	U.A.Bakshi, M.V.Bakshi, "Protection and Switchgear", Technical Publications, 2009. V.K. Mehta and Rohit Mehta, “Principles of Power System”, S. Chand Publisher, 2006.
Lab./Computer work/Project	**Exp. 1**: Substation Bus Arrangement

EED342	**Power System Operation and Control 3 CH (2,2,0)**
Course Contents	Optimal dispatch of generation: Nonlinear function optimization, Operating cost of a thermal plant, Economic dispatch under different assumptions: neglecting losses and constraints, considering generation constraints, including losses. Load frequency control: Model of single-area system, Steady state response, Dynamic response, root-locus, automatic generation control, Model of two area-system, Tie-line bias control, Steady state relationships. Under-frequency Load Shedding: utility schemes, effect of time delay. SCADA and Energy Management Systems. Smart Grid.
Prerequisite (s)	EED344
Textbook	Hadi Saadat, “Power System Analysis”, Third edition, PSA publishing, 2011.
Lab./Computer work/Project	**Course Project 1**: Economic dispatch using PowerWorld simulator. **Course Project 2**: Load frequency control of two area system using Simulink.

EED444	**Power System Planning 3 CH (2,2,0)**
Course Contents	Principles of power system planning. Load forecasting: Extrapolation techniques, Correlation techniques, Least Square method, Stochastic time series, Spatial load forecasting. Generation Cost Analysis: Levelized Cost of Energy (LCE). Reliability of supply systems: Basic reliability mathematics, Series systems, Parallel systems. Reliability of Generation Systems: Building the Capacity Outage Probability Table (COPT) using Binomial expansion and Recursive algorithm, Loss of Load Expectation (LOLE), Generation Expansion Planning. Distribution System Planning: Reliability indices: SAIFI, SAIDI, CAIDI. Transmission planning and substation expansion planning. Demand Side Management (DSM).
Prerequisite (s)	EED344
Textbook	. Turan Gonen, " Electric Power Distribution Engineering, Third Edition, CRC Press, 2016. . Roy Billinton and Ronald Allan, “Reliability evaluation of power systems”, 2nd ed., Springer, 1996.

Lab./Computer	N/A

EED341	**Power Quality 3 CH (2,2,0)**
Course Contents	Terms and Definitions: General classes of power quality problems, Transients, Long-duration voltage variations, Short-duration voltage variations, Voltage fluctuation, Flickers, Power frequency variations, CBEMA and ITI Curves. Voltage Sags and Interruptions: Sources of sags and interruptions, Analysis of voltage sag, Benchmarking, Mitigation. Fundamentals of Harmonics: Harmonic distortion, Voltage versus current distortion, Harmonic indices, Harmonic sources from commercial loads, Harmonic sources from industrial loads, Locating harmonic sources, Benchmarking, Mitigation.
Prerequisite (s)	EED212
Textbook	Surya Santoso, "Fundamentals of Electric Power Quality", Winter 2012 Edition, 2012.
Lab./Computer	N/A

EED347	**Electrical Installations 3 CH (2,2,0)**
Course Contents	Electrical Safety: Effect of current on the human body, Electric shock, Arc flash hazards, Fires. Standards, codes and regulations: IEC 60364, Egyptian code, NEC. Earthing in low voltage systems. Protection against direct contact: Enclosures, Degree of protection IP code. Protection against indirect contact: Residual current device (RCD), Automatic disconnection of supply for TN, TT and IT systems. Protection against fire: Arc fault detection device AFDD. Lighting circuits: Different lamp technologies, Design of indoor lighting system, DIALux program, Design of outdoor lighting (streets/sports area). Wiring systems: estimation of load current, Conductor sizing, Verification of voltage drop, Calculation of short circuit current, Selection of protective device.
Prerequisite (s)	EED212
Textbook	Schneider Electric, "Electrical Installation Guide According to IEC Int. Standards", 2016
Lab./Computer	N/A

EED448	**Advanced Power System Protection 3 CH (2,2,0)**
Course Contents	The basic concepts of digital relaying. Construction of microprocessor relay. Sampling theorem, Aliasing, Anti-aliasing filter. Digital signal identification: three sample method, Four sample method, Phasor measurements. Performance of Current transformers in digital relaying. Implementation of overcurrent digital relay. Implementation of distance digital relay. Practical considerations of digital relays: Binary inputs, Binary outputs, Analysis of disturbance recorders. Fault Location using GPS system and PMUs technology. Application of artificial intelligence in protective schemes. Concept of Adaptive Relaying.
Prerequisite (s)	EED443
Textbook	. Arun G. Phadke, James S. Thorp, "Computer Relaying For Power Systems", Second Edition, Wiley, 2009. . References:A. T. Johns and S. K. Salman, "Digital Protection for Power Systems", Peter Peregrinus Ltd., 1995.
Lab./Computer	N/A

EED348	**Smart Grids 3 CH (2,2,0)**
Course Contents	Introduction to smart grid. Elements of the power grid and measurement technologies. Basic concepts of Wide area monitoring system (WAMS): Advanced metering infrastructure (AMI), and phasor measurement units (PMU). Elements of communication and networking: Architectures, Standards and adaptation of power line communication

	(PLC), Machine to machine communication models for the smart grid. Elements of distributed energy resources (DER) and grid integration: Renewable energy, Energy storage, Electric vehicles (EVs). Elements of management: Aspects of energy management in the smart grid, SCADA, Micro grids.
Prerequisite (s)	EED344
Textbook	James Momoh, “Smart Grid Fundamentals of Design and Analysis”, Wiley, 2012.
Lab./Computer	N/A

EED449	**Selected Topics in Electrical Power Engineering 3 CH (2,2,0)**
Course Contents	This course covers a number of advanced topics in the field of electrical machines, power systems and/or power electronics.
Prerequisite (s)	As advised
Textbook	As advised
Lab./Computer	As advised

EED452	**Special Electrical Machines 3 CH (2,2,0)**
Course Contents	Two-phase induction motors: symmetrical and unsymmetrical two-phase machines. Single-phase induction motors: construction, split-phase, shaded-pole, capacitor-type starting and steady-state operation, equivalent circuit. AC single-phase series motors. Permanent magnet synchronous motors: equivalent circuit and phasor diagram. Stepper motors: permanent magnet and switched reluctance. Permanent magnet brushless DC motors: construction and theory of operation. Linear induction motors: construction and theory of operation. Linear induction motors. Induction generators.
Prerequisite (s)	EED353
Textbook	E.G. Janardanan, “Special Electrical Machines”, Prentice-Hall of India Pvt. Ltd; 1st edition, 2014.
Lab./Computer work/Project	**Exp. 1**: Characteristics of a single-phase capacitor-start IM.

EED354	**Utilization of Electric Energy 3 CH (2,2,0)**
Course Contents	Electric Lighting Technology, Illumination, Basic Principle of Light Control, Lighting Scheme and Layout, Artificial Source of Light and Practical Electrical Wiring. Heating, Electric Furnaces, Advantages of Electrical Heating, Requirements of Good Heating Element, Materials for Heating Element, and Temperature Control of Resistance Heating. Traction, The Properties of Ideal Traction System, The Advantages and Disadvantages of Electrical Traction System, Advantages and Disadvantages of DC and AC Traction, Requirements of Urban and Suburban Traction Service, Requirements of Main Line Traction Service.
Prerequisite (s)	EED212
Textbook	E. Openshaw Taylor and V. V. L. Rao, "Utilization of Electric Energy", Universities Press, 2009.
Lab./Computer work/Project	N/A

EED357	**PLC & Applications 3 CH (2,2,0)**
Course Contents	Components of classic control systems and their applications. Examples of classic control circuits. Introduction to PLCs and their types. PLC hardware configuration. Input and output devices. signal conditioning of inputs and outputs. Input and output modules. Basics

	of PLC programming using ladder (LD) and function block diagram (FBD) languages. Timers: types and programming. Counters: types and programming. Examples of Industrial Applications. Introduction to industrial communication networks and SCADA.
Prerequisite (s)	EED222
Textbook	F. Petruzella, "Programmable Logic Controllers," McGraw-Hill Education, 5th ed., 2017
Lab./Computer work/Project	**Exp. 1.** Timers. **Exp. 2.** Counters.

EED456	**Energy Management** **3 CH (2,2,0)**
Course Contents	Efficient energy management and operation of buildings. Energy conservation opportunities and revision of industrial systems: Generation, Lighting, Compressed air, Fans and pumping water, Air conditioning and water-cooled systems. Understanding utility rates and programs. Introduction to various thermal facilities for industrial systems. Energy management of industrial systems. Efficient operation of industrial systems. General principles for implementing and assessing energy management programs.
Prerequisite (s)	**EED344**
Textbook	Craig Smith, Kelly Parmenter "Energy Management Principles", Second edition, Elsevier publishing, 2015.
Lab./Computer	**--**

EED455	**Advanced Power Electronics** **3 CH (2,2,0)**
Course Contents	DC Power supplies: transformer models, the flyback converters, the forward converter, the double-ended (two-switch) forward converter, the push-pull converter, full-bridge and half-bridge dc-dc converters, the current-fed converters, multiple outputs, converter selection, power factor correction, power supply control, the AC line filter, the complete dc power supply. Resonant Switch Converters: zero-voltage and zero-current switching, Series resonant inverter. High frequency link DC-DC converters. Multilevel inverters: multilevel converters with independent dc sources, diode-clamped multilevel inverters.
Prerequisite (s)	**EED451**
Textbook	D. W. Hart, "Power Electronics", 1st edition, McGraw Hill, 2011.
Lab./Computer work/Project	**Exp. 1.** Simulation of the zero-voltage Resonant Switch Converter **Exp. 2.** Simulation of the zero-current Resonant Switch Converter

EED356	**Communication Systems** **3 CH (2,2,0)**
Course Contents	Simplified block diagram, transmission media (guided and unguided), signal impairments. signal to noise ratio (SNR), bit rate and channel bandwidth, Shannon's equation. Analog and digital messages. Amplitude modulation and demodulation techniques (single side band, double side band and Vestigial side band), Angle modulation and demodulation (PM and FM), Broadcast transmitters and receivers (AM and FM). Principles of digital data transmission: Digital communication system: Sampling Theorem, A/D techniques. Digital modulation (pulse code modulation and delta modulation). Optical fiber communication system, OPGW Cable System.
Prerequisite (s)	**EED231**
Textbook	B.P Lathi, "Modern Digital and Analog Communication Systems", Fourth edition, Oxford University Press, 2010.
Lab./Computer	-

EED258	**Electrical Installations and Construction Equipment** **3 CH (2,2,0)**

Course Contents	Electrical installations: introduction to electric circuits, electrical installations in residential and industrial buildings (lighting, power, telephone, TV, air conditioning, lifts), Acoustic precautions, Alarm systems (Fire, Security, Gas), Electrical design for signaling systems in roads and railways, Electrical print reading. Construction equipment, assessment and selection of construction equipment, earth moving equipment, equipment for concrete production and handling, Steel installations equipment
Prerequisite (s)	**EMP124**
Textbook	**"Building Construction Handbook", 10th Ed., Routledge, 2014**
Lab./Computer	--

EED259	**Electrical Machines**	**3 CH (2,2,0)**
Course Contents	Magnetic circuits: Hysteresis curve, Parallel and series magnetic circuits. Single-phase transformers, Impedance transformation, equivalent circuit, Open- and Short-circuit tests, transformers taps. three-phase transformers. DC Motors: separately- and shunt-exited motors, Starting of DC motors, Permanent magnet DC motors. Three-phase Induction Motors (IM): Construction, Principles of operation, Equivalent circuit, power flow in three-phase IM, Torque and power relationships. 3-phase Synchronous Machines: generators and motors. Stepper Motors: Permanent magnet Stepper Motors, Variable reluctance stepper motor, Brushless DC Motors.	
Prerequisite (s)	EMP124	
Textbook	T. Wildi, S. J., “Electrical Machines, Drives, and Power Systems”, Pearson, 6th ed., 2014.	
Lab./Computer	--	

EED359	**Electrical Machines**	**3 CH (2,2,0)**
Course Contents	Magnetic circuits: Hysteresis curve, Parallel and series magnetic circuits. Single-phase transformers, Impedance transformation, equivalent circuit, Open- and Short-circuit tests, transformers taps. three-phase transformers. DC Motors: separately- and shunt-exited motors, Starting of DC motors, Permanent magnet DC motors. Three-phase Induction Motors (IM): Construction, Principles of operation, Equivalent circuit, power flow in three-phase IM, Torque and power relationships. 3-phase Synchronous Machines: generators and motors. Stepper Motors: Permanent magnet Stepper Motors, Variable reluctance stepper motor, Brushless DC Motors.	
Prerequisite (s)	EMP124	
Textbook	T. Wildi, S. J., “Electrical Machines, Drives, and Power Systems”, Pearson, 6th ed., 2014.	
Lab./Computer	--	

EED461	**Analysis and Design of Algorithms**	**3 CH (2,1,1)**
Course Contents	This is an intermediate algorithms course with an emphasis on teaching techniques for the design and analysis of efficient algorithms. Emphasizing methods of application. Topics: Divide-and-conquer, Randomization, Dynamic programming, Greedy algorithms, Incremental improvement, Complexity, and Cryptography. We will focus on studying basic algorithms at a finer level of detail and more advanced algorithms and data structures.	
Prerequisite (s)	EED362	
Textbook	Cormen, Thomas, Charles Leiserson, et al. Introduction to Algorithms. 3rd ed. MIT Press, 2009. ISBN: 9780262033848.	
Lab./Computer work/Project	We will set programming assignments in Python3. These assignments will require basic **Exp. 1:** knowledge of writing programs in Python3.	

	Exp. 2: Python3 functions, and control loops. **Exp. 3:** Data structures: lists, dictionaries and sets. **Exp. 4:** Classes and Inheritance. **Exp. 5:** Ability to write small projects in Python3, test and debug.

EED463	**Data Mining** **3 CH (2,1,1)**
Course Contents	Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. It is currently regarded as the key element of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of the generated structures.
Prerequisite (s)	EMP115
Textbook	Ian Witten Eibe Frank Mark Hall Christopher Pal, " Data Mining: Practical Machine Learning Tools and Techniques ", Springer.
Lab./Computer	-

EED469	**Fundamentals of Big Data Analysis** **3 CH (2,1,1)**
Course Contents	Definition and taxonomy. Challenges, trends, Applications. Fundamentals of Big data technologies and tools. Business Motivations for Big Data Adoption, Distributed processing ecosystem. The map-reduce paradigm. Big Data Storage and Analytics: Clusters, File Systems, Sharding, Replication. Big data analytics: Parallel and Distributed Data Processing. Machine learning algorithms. Graph analytics. Big data visualization.
Prerequisite (s)	EMP115
Textbook	Thomas Erl, Wajid Khattak and Paul Buhler, " Big Data Fundamentals: Concepts, Drivers & Techniques".
Lab./Computer	Dependent on the selected topic.

EED465	**Natural Language Processing** **3 CH (2,1,1)**
Course Contents	This course introduces the fundamental concepts and theory of Natural Language Processing (NLP; a.k.a. computational linguistics) and its practical tasks. The primary focus of this course is on the fundamental concepts and algorithms/techniques of NLP. The theoretical side is complemented by case studies, practical implementations/programming and projects. Topics to be covered include language models, sentiment analysis, parsing, information extraction and neural language models.
Prerequisite (s)	EED475
Textbook	Jurafsky and Martin. Speech and Language Processing.
Lab./Computer	

EED466	**Cloud Computing** **3 CH (2,1,1)**
Course Contents	This course introduces students to fundamentals of cloud computing and software development for cloud platforms. It covers topics such as virtualization, architecture of cloud systems, programming for the cloud, resource management, as well as privacy and security issues. Students gain practical experience developing applications for cloud platforms through a series of hands-on assignments.
Prerequisite (s)	EED381

Textbook	Marinescu, Dan. Cloud Computing Theory and Practice (2nd Ed.), Elsevier, 2017
Lab./Computer	

EED467	**High Performance Computing 3 CH (2,1,1)**
Course Contents	GPUs are high-performance many-core processors. Students will learn massively parallel programming using CUDA C and develop parallel algorithms to solve real problems. Topics include parallel computing, Performance limits, Parallel algorithms and patterns, GPUs architecture: Programming model, GPU Languages, GPU Profiling and tools, Threads, performance issues, and floating-point representation. High performance computing ecosystems.
Prerequisite (s)	EED223, EED261
Textbook	Robert Robey and Yuliana Zamora, Parallel and High Performance Computing", Manning Pub.
Lab./Computer	**Exp. 1:**

EED464	**Selected Topics in Computer Engineering 3 CH (2,1,1)**
Course Contents	This course covers a number of advanced topics in the field of Computer Engineering.
Prerequisite (s)	As advised
Textbook	As advised
Lab./Computer	As advised

EED473	**Computer Vision 3 CH (2,1,1)**
Course Contents	An introduction to the analysis of images and video in order to recognize, reconstruct and model objects in the three-dimensional world. segmentation; stereo vision; 3-D modeling; and statistical recognition. 2-D sequences and systems. Separable systems. Projection slice. Reconstruction from projections. Partial Fourier information. Motion estimation and compensation standards. Scale image and Video coding. Image and video communication over noisy channels.
Prerequisite (s)	EED337
Textbook	Richard Szeliski, “Computer Vision: Algorithms and Applications", 4th Edition, 2021.
Lab./Computer	**Exp. 1:**

EED472	**Reinforcement Learning 3 CH (2,1,1)**
Course Contents	This course provides an introduction to reinforcement learning, a very active research sub-field of machine learning. Reinforcement learning is concerned with building programs that learn how to predict and act in a stochastic environment, based on past experience. Applications of reinforcement learning range from classical control problems, such as powerplant optimization or dynamical system control, to game playing, inventory control, and many other fields. Notably, reinforcement learning has also produced very compelling models of animal and human learning.
Prerequisite (s)	EED475
Textbook	Richard S. Sutton and A. G. Barto, “Reinforcement Learning,” 2rd Ed., MIT Press, 2018.
Lab./Computer	

EED476	Autonomous Vehicles 3 CH (2,1,1)
Course Contents	This course aims to teach the core concepts that make Self-driving vehicles (SDVs) possible. It is aimed at people who want to get their teeth into self-driving vehicle technology, by providing genuine technical insights into the field. The course tackles everything from sensors and perception to functional safety and cybersecurity. It also passes on some practical know-how and discusses concrete SDV applications, along with a discussion of where this technology is heading. It will serve as a good starting point to learn more about the basics of SDV algorithms.
Prerequisite (s)	EEDx71
Textbook	Hanky Sjafrie, Introduction to Self-Driving Vehicle Technology", Springer, 2020.
Lab./Computer	**Exp. 1:**

EED478	Intelligent Games 3 CH (2,1,1)
Course Contents	The primary focus of this course is on the use of AI techniques for generating efficient, intelligent behaviour in games. Additional attention is given to AI algorithms for improving game play experience. Contents: Model of Game AI, Movement, Pathfinding, Decision making, Tactical and Strategic AI, Learning, Board Games, Algorithms and Data Structures, Game AI, Techniques, Supporting Technologies.
Prerequisite (s)	EED371
Textbook	Ian Millington, “AI for Games”, Routledge
Lab./Computer	

EED477	Intelligent Control Systems 3 CH (2,1,1)
Course Contents	The course provides a general introduction to intelligent systems, provide examples of rule-based control systems, describes design requirements of intelligent controllers. studies a range of methodologies for specifying and designing intelligent systems. understands control methodologies developed using soft computing tools such as fuzzy logic, neural nets and Gas, and describes and apply systems engineering methods and techniques in the design and analysis of intelligent control systems for mechatronics applications.
Prerequisite (s)	EED371
Textbook	Ali Zilouchian & Mo Jamshidi, Intelligent Control Systems Using Soft Computing Methodologies, CRC Press.
Lab./Computer work/Project	**Exp. 1:** **Project:**

EED474	Computational Intelligence 3 CH (2,1,1)
Course Contents	Definitions. Learning theory. Soft-computing paradigm. Fuzzy systems: Fuzzy sets and relations, Operations on fuzzy sets, Fuzzy logic, Approximate reasoning, Fuzzy control. Neural networks: Machine learning using neural networks, Supervised learning, Unsupervised learning, Competitive learning, Reinforcement learning, Neuro-dynamic programming, Neuro-fuzzy systems. Evolutionary computation: Genetic algorithms, Genetic programming, Genetic optimization, Machine learning using genetic algorithms. Particle swarm optimization. Bayes networks. Artificial immune systems. Rough theory. Granular computing. Chaos theory. Tools used in developing computational intelligence algorithms.
Prerequisite (s)	EED371
Textbook	Andries P. Engelbrecht, "Computational Intelligence: An Introduction", 2nd Edition, ISBN-13: 978-0470035610.
Lab./Computer	--

EED479	Selected Topics in Intelligent Systems Engineering 3 CH (2,1,1)
Course Contents	This course covers a number of advanced topics in the field of intelligent systems engineering.
Prerequisite (s)	As advised
Textbook	As advised
Lab./Computer	As advised

EED426	Real-time Embedded Systems 3 CH (2,1,1)
Course Contents	This course introduces students: Basics of models, Analysis tools, and Control for embedded systems operating in real time. Students learn how to combine physical processes with computation. Topics include: Models of computation, Control, Analysis and verification, interfacing with the physical world, Mapping to platforms, and Distributed embedded systems. The course has a strong Exploratory component with emphasis on a semester-long sequence of projects.
Prerequisite (s)	EED323
Textbook	E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems- A Cyber-Physical Systems Approach, Second Edition", 2nd Edition, 2015. References Book: Chapman, S. J., “Electric Machinery fundamentals”, McGraw Hill, 4th edition, 2005.
Lab./Computer work/Project	Integrating several assignments/experiments and projects in the applications of the Real-time Embedded Systems.

10.D. Engineering Mathematics & Physics Course Descriptions

EMPxxx Courses

EMP113	Calculus I 3 CH (2, 2, 0)
Course Contents	Limits; Properties, Continuity; Basic differentiation rules, Derivatives of functions with all rules (implicit; parametric; logarithmic; L'Hopital's rule). Derivatives of Trigonometric and Inverse Trigonometric Functions, Transcendental Functions. Hyperbolic and Inverse Hyperbolic Functions. The Chain Rule. Application of derivatives (maxima and minima problems, Mean value theorem, Optimization, and Taylor's series). Partial derivatives and their applications. Antiderivative and theorem of calculus.
Prerequisite (s)	--
Textbook	Robert T.Smith, Roland B Minton, Ziad A.T . Rafhi, “Calculus Early transcendental Functions”, 5th edition, Mc Graw Hill education, ISBN-10 0077166477, 2018.
Lab./Computer work/Project	N/A

EMP114	Calculus II 3 CH (2, 2, 0)
Course Contents	Anti-derivatives. Definite and indefinite Integral. Techniques of integration (integration by parts, trigonometric substitutions, integration of rational functions, quadratic expressions, substitutions, and integration by reduction). Applications of definite integrals (area, volume, arc length, and surface area of a solid revolution). Multiple integrals (double and triple). Polar coordinates. Cylindrical and spherical coordinates. Applications of multiple integrals.
Prerequisite (s)	EMP113
Textbook	Robert T.Smith, Roland B Minton, Ziad A.T . Rafhi, “Calculus Early transcendental Functions”, 5th edition, Mc Graw Hill education, ISBN-10 0077166477, 2018.
Lab./Computer work/Project	N/A

EMP115	Probability & Statistics 3 CH (2, 2, 0)
Course Contents	Probability definitions and concepts; Conditional probability; Statistical independence and Bayes theorem; Discrete and continuous random variables; Distribution functions; Probability distributions and moments; Random variables and their probability distributions including uniform, binomial, hypergeometric, gamma, Poisson, normal, and exponential distributions; Joint distributions; Expected value and variance; Sampling distributions; Statistical inference including hypothesis testing and interval estimation; Correlation analysis; Regression analysis; Applications using MATLAB.
Prerequisite (s)	--
Textbook	Ronald E. Wapole.” Probability and Statistics for Engineers and Scientists” 2016.
Lab./Computer work/Project	N/A

EMP123	Physics I 3 CH (2, 2, 1)

Course Contents	Physics and measurements, Vectors, Energy of a system, conservation of energy, Elastic Properties of materials, Fluid Mechanics, Temperature, The first law of thermodynamics, The kinetic theory of gases, Heat engines, entropy, and the second law of thermodynamics, The nature of light and principle of ray optics, Image formation.
Prerequisite (s)	--
Textbook	"Physics for Scientists and Engineers with Modern Physics", 9th Edition, Serway / Jewett. “Principle of Physics”, 10th Edition, Walker Halliday and Resnick.
Lab./Computer work/Project	Exp.1: Hooke’s Law Exp.2: Viscosity Exp.3: Specific Heat of Solids Exp.4: Lee’s Disk Exp.5: Young’s Modulus of Elasticity

EMP124	**Physics II**	**3 CH (2, 2, 1)**
Course Contents	Electric fields, Electric flux, Gauss’s Law and its application to various charge distributions, Electric Potential, Capacitance, and dielectrics, Current and resistance, Direct-current circuits, Magnetic fields, Sources of magnetic fields, Faraday’s Law, Inductance.	
Prerequisite (s)	--	
Textbook	"Physics for Scientists and Engineers with Modern Physics" 9th Edition, Serway / Jewett. “Principle of Physics”, 10th Edition, Walker Halliday and Resnick.	
Lab./Computer work/Project	Exp.1: Ohm’s Law Exp.2: Meter Bridge Exp.3: Transformers Exp.4: RC-Circuit Exp.5: Helmholtz Magnetic Field Experiment	

EMP131	**Engineering Mechanics**	**3 CH (2, 2, 0)**
Course Contents	Statics: general principles, vectors and equilibrium of a particle, force system resultants, forces and moments, forces about an axis; couples and force-couple systems and equilibrium of rigid bodies (2D and 3D), Center of gravity and centroid. Dynamics: kinematics of a particle, kinetics of a particle: force and acceleration, kinetics of a particle: work and energy and kinetics of a particle: Impulse and momentum.	
Prerequisite (s)	--	
Textbook	Hibbeler R.C., “Engineering Mechanics: Dynamics “, 13th Edition, 2013. ISBN-13: 978-0135841495	
Lab./Computer	N/A	

EMP141	**Engineering Drawings**	**2 CH (1, 3, 0)**
Course Contents	Standards and techniques of technical graphics, descriptive geometry, orthographic projection, Multi-views, Projection Theory, engineering drawing techniques, design process, computer-aided engineering modeling, and fabrication of an idea through rapid prototyping techniques.	
Prerequisite (s)	--	
Textbook	G. R. Bertoline, Introduction to Graphic Communication for Engineers, 5th Edition. McGraw Hill, 2021. D. A. Madsen and D. P. Madsen, Engineering Drawing and Design, 6th edition. Cengage Learning, 2016.	
Lab./Computer	N/A	

EMP151	General Chemistry 3 CH (2, 0, 2)
Course Contents	Classifications of Matter, Physical and Chemical Properties of Matter, Atomic Theory, Structure of the Atom, Atomic Number, Mass Number, and Isotopes, The Periodic Table, Molecules and Ions, Chemical Formulas, Naming Compounds, Organic Compounds, Mass Relationships in Chemical Reactions, Reactions in Aqueous Solutions, Gases: Substances That Exist as Gases, Pressure of a Gas, The Gas Laws, The Ideal Gas Equation, Gas Stoichiometry, Dalton's Law of Partial Pressures, Thermochemistry. The Nature of Energy and Types of Energy, Energy Changes in Chemical Reactions.
Prerequisite (s)	--
Textbook	"General Chemistry", Chang, Mcgraw Hill, 13^{th} edition
Lab./Computer work/Project	Exp.1- General lab. Safety Exp.2- Group 1 acidic radical: Dil HCl, CO3 --, HCO3 - , S2O3 -- , BaCl2, MgSO4 Exp.3- Group 2 acidic radical: Conc. H2SO4, Cl- , Br- , I- , NO3 - , AgNO3, Pb(CH3COO)2 Exp.4- Scheme of identification of acidic radicals Exp.5- Group 1 basic radical Pb+2, Ag+ , Hg+ , dil HCl, KI, K2CrO4 Exp.6- Group 2 basic radical Cu+2, Cd+2, Bi+3 , dil HCl, H2S,NaOH, NH4OH

EMP213	Differential equations 3 CH (2, 2, 0)
Course Contents	Functions of several variables; First order differential equations; Second order linear differential equation; System of linear differential equations; Initial and boundary value problems; Euler and Rung-Kutta methods; Numerical differentiation; Introduction to partial differential equations; applications of differential equations using MATLAB.
Prerequisite (s)	EMP114
Textbook	Robert T.Smith, Roland B Minton, Ziad A.T . Rafhi, "Calculus Early transcendental Functions", 5th edition, Mc Graw Hill education, ISBN-10 0077166477, 2018.
Lab./Computer	N/A

EMP214	Transformations & Complex Analysis 3 CH (2, 2, 0)
Course Contents	Convolution and Laplace transform; Inverse Laplace transform methods; Conformal mapping; Fundamentals of z transform; Inverse z-transform methods; Difference equation and solution using z-transform technique; Vector Analysis in different coordinate systems; Calculus of vector fields; Complex Analysis; Applications using MATLAB.
Prerequisite (s)	--
Textbook	Warren S. Wright, Dennis G. Zill, "Advanced Engineering Mathematics", Jones & Bartlett Learning. 2003
Lab./Computer	N/A

EMP216	Discrete Mathematics and Numerical Methods 3 CH (2, 2, 0)
Course Contents	This course provides a comprehensive introduction to the foundational concepts of Discrete Mathematics and Numerical Methods for students in computer and intelligent systems. Topics in discrete mathematics include logic and proofs, set theory, functions, sequences, and summation, mathematical induction, recursion, counting principles, relations, graph theory, and applications in finite state machines and finite automata. In the Numerical Methods section, the course covers the numerical solution of a system of linear equations and the Numerical solution of non-linear equations, curve fitting, numerical integration, and differentiation.
Prerequisite (s)	EMP113

Textbook	Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th edition, McGraw-Hill, Inc., 2007. Warren S. Wright, Dennis G. Zill, Advanced Engineering Mathematics, 6th edition, Jones & Bartlett Learning, 2018.
Lab./Computer	N/A

EMP217	**Linear Algebra & Geometry**	**3 CH (2, 2, 0)**
Course Contents	**Linear Algebra:** Definitions and properties of determinant and matrices; System of Linear equations, Eigen values, and Eigenvectors of a matrix with applications, Gauss elimination method, solve a system of linear equations using inverse matrices, bases, dimension, Coordinates, orthogonality, and linear transformations. **Analytical Geometry:** Definitions and properties of conic sections, Translation and Rotation of Axes, Vectors, Planes and Lines in Space; Surface of second degree.	
Prerequisite (s)	--	
Textbook	Robert T.Smith, Roland B Minton, Ziad A.T . Rafhi Calculus Early transcendental Functions 5 edition .Mc Graw Hill education .ISBN-10 0077166477. 2018.	
Lab./Computer	N/A	

EMP225	**Waves and Vibrations**	**3 CH (2, 1, 1)**
Course Contents	Wave motion, standing wave, mechanical waves P-wave, S-wave, Love-wave, Rayleigh-wave. Propagation of mechanical waves in solids. Single and multi-degrees of freedom vibrating systems, viscose damping, friction damping, damped mechanical vibrating systems. Impact exited vibrating systems, harmonic exited vibrating systems and Random exited vibrating systems, Mechanical resonance.	
Prerequisite (s)	EMP123	
Textbook	"Physics for Scientists and Engineers with Modern Physics" 9th Edition, Serway / Jewett. “Principle of Physics”, 10th Edition, Walker Halliday and Resnick.	
Lab./Computer work/Project	Exp.1: Simple Pendulum. Exp.2: Damped Mechanical vibration Exp.3: Exited Mechanical vibration	

EMP226	**Materials Science**	**2 CH (2,1,0)**
Course Contents	Introduction to materials, The design and selection of materials for use in advanced engineering applications, as well as their processing, properties. Structure, composition, microstructure and design of advanced engineering materials, composites, advanced alloys and engineering ceramics used in electronics, processing of advanced materials and Nanomaterials, Defects in materials, Equilibrium phase diagrams, and Heat treatment.	
Prerequisite (s)	--	
Textbook	William D. Callister, Jr. David G. Rethwisch, “ Materials Science And Engineering An Introduction”, 10th Edition, Wiley, 2018.	
Lab./Computer	N/A	

EMP227	**Solid State Physics**	**3 CH (2, 2, 1)**
Course Contents	Semiconductor material properties: Crystal structure of solids, Introduction to quantum mechanics, Introduction to the quantum theory of solids, Semiconductor in equilibrium, Carrier transport phenomena, Non-equilibrium excess carriers in semiconductors. pn junction: Basic structure, reverse applied bias, junction breakdown, pn junction current, Generation–recombination currents, and Small-signal model of the pn junction.	

Prerequisite (s)	EMP124
Textbook	Donald A. Neamen, "Semiconductor Physics and Devices: Basic Principles", 4th Edition. McGraw-Hill.
Lab./Computer work/Project	Exp.1: Photoelectric Effect. Exp.2: Specific Charge of Electron Exp.3: PN Junction I/V Characteristics Exp.4: Several NanoHub simulations of PN Junction

EMP251	**Organic Chemistry** **3 CH (2,1,2)**
Course Contents	Molecular composition and structure of organic compounds: determination and calculation of empirical and molecular formulae, pictorial treatment of hybridization. Organic Reactions: Bond formation and fission, classification of reagents and reactions, reaction intermediates: Carbonations, free radicals, carbanions. Hydrocarbons: (aliphatic, alicyclic and aromatic), structure and nomenclature. Homologous series, and gradation of properties, preparation, reactions.
Prerequisite (s)	EMP151
Textbook	1. Francis A. Carey Robert M. Giuliano, Organic chemistry, 8th edition, 2009. 2. Students Lecture Notes (Text Book). 3. Periodicals, Web sites, … etc http://www.black-tides.com/uk/oil/oil-everyday-lives/products-obtained-fromcrude-oil.php
Lab/Computer work/Project	Organic Chemistry Lab

EMP371	**Geology** **3 CH (2,2,1)**
Course Contents	Introduction to geology, classification and properties of minerals and rocks, Geological features (Faults, folds, joints), Introduction to soil mechanics, Soil classification, Rock and soil laboratory tests, Site investigations and field tests
Prerequisite (s)	--
Textbook	A Geology for Engineers - 7th Edition - F.G.H. Blyth –Michaelde Freitas
Lab./Computer work/Project	Exp.1: UCS of Rock Exp.2: Grain size analysis Exp.3: Consistency limits

EMP411	**Numerical Analysis** **3 CH (2,2,0)**
Course Contents	Numerical solution of a system of linear and non-linear equations, curve fitting (interpolation), Regression analysis, numerical solution of ordinary differential equations, single variable and multi-variables finite difference method, finite element method. Applications of numerical methods in solving civil engineering problems.
Prerequisite (s)	EPM114
Textbook	Dennis G.Zill " A first course in Complex Analysis with Applications" , Jones and Bartlett Publisher, 2003
Lab./Computer work/Project	N/A

10.E. MECHANICAL ENGINEERING COURSE DESCRIPTIONS

MECxxx Courses

MEC151	Production Technology	2 CH (1,0,3)
Course Contents	Standards, measurement, and gauging. Measuring equipment. Hand Processes. Marking out. Sheet-Metal Operations. Cutting tools and cutting fluids. Drilling, turning, surface grinding, milling, joining methods (fasteners, riveting, soldering, brazing, and welding), primary forming processes (sand casting, rolling, extrusion, drawing and forging), and presswork.	
Prerequisite (s)	-	
Textbook	Bruce J. Black.; "Workshop Processes, Practices and Materials"; Elsevier.	
Lab./Computer work/Project	Exp. 1: Turning and Drilling Exp. 2: Milling and Surface Grinding Exp. 3: Welding Exp. 4: Wood Processes Exp. 5: Sheet Metal Works Exp. 6: Sand Casting **Project:** A group project where students manufacture an item using the processes described in the course. The item to be manufactured is to be approved by the course instructor. The project will be presented during lab time and a project report will be handed in with the presentation.	

MEC211	Solid Mechanics	3 CH (2,2,0)
Course Contents	Equilibrium, Continuity, Normal force, Shearing force, Bending and twisting moment diagrams, Stresses in simply loaded elastic bars: axial loading, bending and torsion, deformation, strain Energy, Stresses in elastic and elasto-plastic bars, Residual stresses. Combined loading, Eccentric normal load, Two-dimensional stresses, Principal stresses, Maximum shear stress, Allowable stresses, Mohr's circle representation and applications. Theory of Failure. Displacement and deflections, Energy methods applied to bar problems, Buckling of columns, Analysis of bars of thin walled sections in shear, Transverse shear, Introduction to structural analysis by matrix methods.	
Prerequisite (s)	EMP131	
Textbook	Ragab, Abdel-Rahman A., and Bayoumi, Salah Eldin Ahm. Engineering Solid Mechanics: Fundamentals and Applications. United Kingdom, CRC Press, 2018. Hejazi, Farzad, and Kar Chun, Tan. Advanced Solid Mechanics: Simplified Theory. United States, CRC Press, 2021.	
Lab./Computer	N/A	

MEC231	Thermodynamics	3 CH (2,2,1)
Course Contents	Introduction; fields of application, fundamental concepts and definitions. Thermodynamic systems; system classification, properties and state processes and cycles. Properties of a pure substance, vapor - liquid - solid - phases of pure substance, ideal gas relations. Work and heat; definitions, kinds of work, heat transfer modes. First law of thermodynamics; closed system analysis, control volume analysis and applications, transient process analysis. Second law of thermodynamics; concepts of heat engines and refrigerators, Carnot cycle.	

Prerequisite (s)	EMP123
Textbook	" Thermodynamics, An Engineering Approach" Yunus A. Cengel , Latest Edition, Mc Graw Hill ,7th ed
Lab./Computer work/Project	**Exp. 1**: Equation of state of ideal gas **Exp. 2**: Vapor pressure of water at high temperature **Exp. 3**: Heat capacity measurement of gases **Exp. 4**: Application on first law of thermodynamics

MEC232	**Fundamentals of Fluid Science**	**3 CH (2,2,1)**
Course Contents	Basic properties of fluids and fundamental concepts. Statics of fluids; pressure, pressure measurement devices, hydrostatic forces and buoyancy. Fluid kinematics. Basic equations of fluid flow; conservation of mass, fluid momentum and energy, Bernoulli's equation, energy equation and applications. Internal flow; laminar and turbulent flow in ducts and pipes and their applications. External flow; lift and drag forces. Basics of dimensional analysis and dynamic similarity.	
Prerequisite (s)	EMP123	
Textbook	Yunus A. Çengel and John M. Cimbala, "Fluid Mechanics -Fundamentals and Applications", McGraw-Hill.	
Lab./Computer work/Project	**Exp. 1:** Flow visualization **Exp. 2:** Bernoulli principal demonstration **Exp. 3:** Losses in pipes **Exp. 4:** Impact of water jet	

MEC244	**Applied Thermodynamics**	**3 CH (2,2,0)**
Course Contents	Availability and second-law analysis. Power cycles: air standard and actual cycles; reversed cycles: refrigerators and heat pumps, gas mixtures, psychrometry and air conditioning, hydrocarbon reactions, waste heat recovery.	
Prerequisite (s)	MEC231	
Textbook	Yunus A. Çengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", McGraw Hill.	
Lab./Computer	N/A	

MEC252	**Manufacturing Processes**	**3 CH (2,2,0)**
Course Contents	Advanced Manufacturing Systems, the modern techniques used in the manufacturing process, automation, Fundamentals of Machining and metal Casting and special topics related to the manufacturing processes, traditional and non-traditional processes, and laser cutting. Manufacturing Management, evaluating its performance and proposing improvement enhancement.	
Prerequisite (s)	MEC151	
Textbook	"Manufacturing Engineering and Technology" 7th Edition By: S. Kalpakjian, and S.K. Schmid, Pearson, Printice Hall, 2013	
Lab./Computer work/Project	**Lab. 1**: Turning and drilling **Lab. 2**: Milling, Shaping **Lab. 3**: Forging and Rolling **Lab. 4**: Oxyacetylene gas welding, Electric Arc Welding **Lab. 5**: Sand Casting **Project**: A group project where students are expected to complete a manufacturing project where they will integrate the material learned in the course.	

MEC253	Mechanical Engineering Drawing	2 CH (1,0,3)
Course Contents	Computer-aided drafting, Mechanical details and assembly drawings, Working drawings, Geometrical tolerances, Welding symbols and details, Introduction to 3D modelling.	
Prerequisite (s)	EMP141	
Textbook	Giesecke, F.E., and others, "ENGINEERING GRAPHICS" Pearson Prentice-Hall, Latest edition..	
Lab./Computer work/Project	Use available software packages for modeling, drawing of different projections views and assembly drawings.	

MEC254	Materials Science and Stress Analysis	3 CH (2,2,0)
Course Contents	Introduction to materials, The design and selection of materials for use in advanced engineering applications, as well as their processing, properties. Structure, composition, microstructure and design of advanced engineering materials, composites, advanced alloys and engineering ceramics used in electronics, processing of advanced materials and Nanomaterials, Defects in materials, Equilibrium phase diagrams, and Heat treatment.	
Prerequisite (s)	-	
Textbook	"Foundation of Materials Science &Engineering" 4th ed., William Smith, and Javed Hashemi , McGraw-Hill Co (SI Version)	
Lab./Computer work/Project	**Exp. 1**: Tension Test **Exp. 2**: Hardness Test **Exp. 3**: Impact Test **Exp. 4**: Torsion Test **Exp. 5**: Fatigue Test	

MEC261	Engineering Dynamics	2 CH (1,3,0)
Course Contents	Kinematics of Particles: Rectilinear Translation and Curvilinear Translation. Kinetics of Particles. Types of planar motion of rigid body; Kinematics of Rigid bodies: Translational, Rotational, and General Plane Motion Equations. Instantaneous centre, Relative velocity and Relative acceleration. Kinetics of rigid bodies: Newton's laws and equations of motion. Principle of work and energy, Conservation of mechanical energy, Linear and angular impulse. Principle of impulse and momentum, Conservation of Momentum.	
Prerequisite (s)	EMP217	
Textbook	Meriam, James L., et al. Engineering Mechanics: Dynamics. United Kingdom, Wiley, 2020. Tongue, Benson H., and Kawano, Daniel T. Engineering Mechanics: Dynamics. United Kingdom, Wiley, 2020.	
Lab./Computer	N/A	

MEC312	Mechatronics System Design	3 CH (2,2,1)
Course Contents	Introduction to mechatronic system design. Electromechanical System Design: Rotary motion (Direct Drive), Rotary motion (Gearhead), Rotary Motion (Belt and Pulley), Linear motion (Leadscrew/Ball screw), Linear motion (Belt and Pulley), Linear Motion (Rack and pinion), Linear Motion (Roll feed).Design and selection of mechatronics system elements including computing devices (PLC, microcontroller, DSP, FPGA), Sensors and actuators. Monitoring the industrial processes, Fault detection and diagnosis. Train students to design and evaluate complete mechatronics systems (Group project).	
Prerequisite (s)	MEC331	
Textbook	- Alciatore, David G.; "Introduction to Mechatronics and Measurement System", McGraw Hill. 5th edition 2018. - Bolton, William; "Mechatronics: Electronic Control Systems in Mechanical and Electrical	

	Engineering"; Prentice Hall. 5th edition 2013. - Kaltjob "Mechatronic Systems and Process Automation Model-Driven Approach and Practical Design Guidelines". CRC Press Taylor & Francis Group. 1th edition 2018.
Lab./Computer work/Project	Experiments to operate, control, and diagnose "Amatol production line" as an example of overall mechatronics system. Team project for students to make an idea of their own designing new mechatronics system using Arduino, raspberry PI and PLC, giving reason for their selection and design based on knowledge and skills gained in course.

MEC313	**Sensors and Instrumentation**	**3 CH (2,2,1)**
Course Contents	Definition of mechatronic system, importance of sensors in mechatronic systems, Instrumentation techniques incorporating computer control, sampling, and data collection. Data analysis, Transducers and sensors, measurement principles, resistive, inductive, capacitive impedances. Difference and instrumentation amplifiers, Active filters. Data acquisition systems. Displacement measurements, Velocity and acceleration measurements. Measurements of pressure. Measurements of fluid flow rates. Measurements of temperature. Measurements of force. Viscosity measurements. Modern and advanced transducers.	
Prerequisite (s)	EMP123	
Textbook	J P Holman, "Engineering Measurements", McGrowHill, Latest edition. W.Bolton, "Mechatronics: electronic control systems in mechanical engineering", Pearson-Prentice Hall	
Lab./Computer work/Project	**Exp. 1**: Thermal sensor Kit. **Exp. 2**: Motion sensor kit. **Exp. 3**: Pressure and flow measurement.	

MEC322	**Automatic Control**	**3 CH (2,3,0)**
Course Contents	Review of dynamic models and dynamic response of systems. Linearisation and scaling of models. Block diagram. Transfer functions. First and second order systems. Open-loop vs. closed-loop control. Feedback control and sensitivity. Types of feedback, PID control. Steady state error and system stability. Root locus analysis and design. Review of PID control in a root locus framework. Nyquist stability criterion, gain margin, phase margin. Dynamic compensation, design of lead-lag compensators.	
Prerequisite (s)	MEC331	
Textbook	Norman S. Nise "Control System Engineering", 8th edition, Wiley, 2020.	
Lab./Computer	N/A	

MEC326	**Programmable Logic Controllers (PLCs)**	**3 CH (2,0,3)**
Course Contents	Introduction- Classic Control- PLC hardware components -Basics of PLC Programming languages- Programming of: Timers, Counters, and Control Instructions -Data Manipulation Instructions-Math Instructions-Sequencer & Shift register - Analog I/O- PLC Commissioning, maintenance, and Trouble shooting.	
Prerequisite (s)	EED329	
Textbook	Frederick Frank D. Petruzella, "Programmable Logic Controllers"; McGraw-Hill, 6th ed., 2023.	
Lab./Computer work/Project	**Lab. 1**: Safety Instructions- Familiarization with PLCs **Exp.2**: Installation and configuration of the PLC software **Exp. 3**: Relay instructions **Exp. 4**: Timer Instructions **Exp. 5**: Counter Instructions **Exp. 6**: Comparison Instructions	

	Exp. 7: Move Instructions **Exp. 8**: PLC Application (Example: Traffic lights) **Exp. 9**: PLC Application (Example: Stepper Motor) **Exp. 10**: PLC Application (Example: DC Motor) **Exp. 11**: PLC Application (Example: Automatic Bottling) **Exp. 12**: PLC Application (Example: Yaw Pitch Control in Wind Turbine)

MEC331	**System Dynamics and Modelling**	**3 CH (2,2,1)**
Course Contents	Mathematical modelling of dynamic systems, block diagram reduction modeling of mechanical systems, modelling of electrical systems, modelling of fluid systems, modelling of thermal systems, Simulation of dynamic systems. Linearisation and scaling of models. First and second order systems. Dynamic systems performance evaluation. Examples design using MATLAB.	
Prerequisite (s)	EMP214	
Textbook	Katsuhiko Ogata, "Modern Control Engineering", Latest Edition, Pearson.	
Lab./Computer work/Project	**Exp. 1**: Introduction to MATLAB SIMULINK. **Exp. 2**: Introduction to MATLAB programming. **Exp. 3**: Block diagram reduction using MATLAB. **Exp. 4**: MATLAB for modeling Mechanical systems. **Exp. 5**: MATLAB for modeling Electrical systems. **Exp. 6**: MATLAB for modeling Thermal systems. **Exp. 7**: MATLAB for modeling Fluid systems. **Exp. 8**: Performance evaluation of systems using MATLAB (rise, settling time & overshoot). **Exp. 9**: Introduction to System Identification Toolbox. **Exp. 10**: Develop an identified model based on Input/output data. **Exp. 11**: Develop several types of identified models (T.F. S.S and NLARX models).	

MEC334	**Turbomachinery**	**3 CH (2,2,1)**
Course Contents	Introduction; classification of turbomachinery, practical uses. Basic equations. Turbines; types,theory and applications. Hydraulic turbines performance and characteristics. Steam and gas turbines; radial and axial flow turbines. Pumps and compressors; classification, theory and applications. Centrifugal flow pumps, fans and compressors. Axial flow pumps, fans and compressors.	
Prerequisite (s)	MEC232 & MEC244	
Textbook	Earl Logan Jr., " Turbomachinery: Basic Theory and Applications", CRC press.	
Lab./Computer work/Project	1. Experiments applied on different fluid machinery including water turbines, pumps, etc. 2. Mini projects. 3. Researches about problems related with turbo-machinery.	

MEC341	**Hydrogen Generation and Application**	**3 CH (2,2,0)**
Course Contents	Knowledge of hydrogen chemistry – The hydrogen economy – Basic chemistry of hydrogen and hydrogen safety – Hydrogen production methods – Hydrogen production from natural gas – Water electrolysis and chlor-alkali electrolysis – Hydrogen storage methods – Hydrogen distribution – Hydrogen uses – Hydrogen fuel cells, ICE, and gas turbines.	
Prerequisite (s)	MEC349	
Textbook	Agata Godula-Jopek and Detlef Stolten, "Hydrogen Production: by Electrolysis", 1st Edition, Wiley-VCH, 2015.	
Lab./Computer	N/A	

MEC342	**Solar Thermal Energy**	**3 CH (2,3,0)**

Course Contents	Introduction of solar thermal energy, residential, commercial and industrial applications, solar radiation, heat transfer, plane and concentrated collectors, water heating applications, heating and cooling the buildings, ,thermal industrial applications, Water desalination, Solar thermal energy system.
Prerequisite (s)	MEC349
Textbook	- Spiros Alexopoulos, Soteris A. Kalogirou, Solar Thermal Energy, Springer, 2022.
Lab./Computer work/Project	- Mini projects for utilizing solar thermal energy

MEC343	**Wind Energy Systems**	**3 CH (2,2,0)**
Course Contents	Historical applications of wind energy, Electrical Power from the Wind and the batteries, Wind energy system (rotor blades, the tower, Mechanical Drive, Electrical System, etc), Physical Principles of Wind Energy Conversion, Basic concepts of wind energy Converters (turbines), Electric power from wind energy, Wind turbine design and control, Wind turbine installation, siting, integration and operation. Offshore and onshore wind turbines. Wind systems economics and costs.	
Prerequisite (s)	MEC349	
Textbook	- Nelson, Vaughn; Starcher, Kenneth , Wind energy : renewable energy and the environment, CRC Press, 2019.	
Lab./Computer work/Project	N/A	

MEC344	**Fundamentals of Heat Transfer**	**3 CH (2,2,0)**
Course Contents	Mechanisms of heat transfer. Steady heat conduction in plane wall; thermal resistance concept, thermal resistance networks, thermal contact resistance. Heat conduction in cylinders and spheres. Critical radius of Insulation. Heat transfer from extended surfaces. Optimum thickness of Insulation. Transient heat conduction. External forced convection over flat plates, cylinders, spheres. Internal forced convection inside pipes and ducts. Basics of heat radiation. Introduction to heat exchangers; types, fouling and analysis. Introduction to Mass transfer.	
Prerequisite (s)	MEC232	
Textbook	- Bergman, Theodore L., et al. “Fundamentals of Heat and Mass Transfer”. United Kingdom, Wiley, 8th ed., 2020.	
Lab./Computer work/Project	**Exp.1:** Determination of the thermal conductivity coefficient of an insulating material **Exp.2:** Determination of the heat transfer coefficient in forced and natural convection heat transfer **Exp. 3:** Determination of the temperature of a metal piece using the optical pyrometer **Exp.4:** Heat exchanger evaluation **Exp.5:** Study of surface properties of two tubes in steam condensation	

MEC349	**Sustainable and Renewable Energy Sources**	**3 CH (2,2,1)**
Course Contents	Introduction to renewable energy resources including solar, wind, geothermal, tidal, sea waves, ocean thermal, bio-fuel and nuclear energies: theories of operation, governing equations, analysesand applications. Study of related components and measuring equipment. Evaluating the performance of renewable energy systems. Energy management. Case studies and economical considerations for renewable energy based power plants.	
Prerequisite (s)	MEC231	
Textbook	- Mehmet Kanoglu, Yunus Cengel and John Cimbala, Fundamentals and Applications of Renewable Energy, McGraw-Hill, 2020.	
Lab./Computer work/Project	- Design project for small and large power plants operating based on different renewable energy resources.	

	- Researches about problems related with renewable energy resources.

MEC352	**Mechanical Design 1**	**3 CH (2,3,0)**
Course Contents	Introduction to Mechanical Engineering Design, Failures resulting from static loading and from dynamic loading. Design of Mechanical Elements: Shafts, Shaft components, screws, fasteners, the design of nonpermanent joints, Welding, Bonding, the design of permanents joints and Mechanical Springs. Bearings (Rolling-contact bearing, journal Bearing). Application of CAD and Solid Works is illustrated and encouraged. Group design project.	
Prerequisite (s)	MEC211 & MEC253	
Textbook	Shigley's Mechanical Engineering Design, Tenth Edition, McGraw Hill, 2022.	
Lab./Computer work/Project	**Lap 1**: Solid Works Training **Lap 2**: Solid Works Training **Lap 3**: Solid Works Training **Project Work**: Assembly drawing project	

MEC353	**Mechanical Design 2**	**3 CH (2,3,0)**
Course Contents	Design of Mechanical Elements: Gears (spur, helical, bevel and worm gears). Clutches, Brakes, Couplings, Flywheels. Design of Flexible Mechanical Elements (Belts, Chains, Flexible shafts). Power transmission, Application of CAD and Solid Works is illustrated and encouraged. Group Design project on Power transmission using Solid Works	
Prerequisite (s)	MEC356	
Textbook	Shigley's Mechanical Engineering Design, Tenth Edition, McGraw Hill, 2022.	
Lab./Computer work/Project	Lap 1: Solid Works Training Lap 2: Solid Works Training Lap 3: Solid Works Training Project Work: Assembly drawing project	

MEC356	**Theory of Machines**	**3 CH (2,2,0)**
Course Contents	Kinematics Fundamentals: geometry of motion and mechanism topology, Linkage and mechanisms analysis of position, velocity, and acceleration (using graphical, analytical and computer-assisted methods), Cam-follower mechanisms: design and analysis, Standard cams and equivalent mechanisms, Kinematics of gear trains: gears terminology, simple, compound, and planetary gear trains, Kinetics fundamentals: force analysis of mechanisms, Applications to engine balancing machines, Applications and use of Computers (using Solid Works) for Mechanism Simulation and Animation.	
Prerequisite (s)	MEC261	
Textbook	Robert Norton, Design of Machinery, 6th Edition, McGraw Hill, 2019	
Lab./Computer work/Project	**Project 1**: working mechanism soft ware **Project 2**: working mechanism prototype	

MEC421	**Microprocessors and Embedded Systems**	**3 CH (2,2,1)**
Course Contents	Introduction to bus architectures and programming; Device and system firmware; Microprocessor and I/O architectures; Memory architectures; Interrupt service routines; Real-time clocks/timers; Real-time debugging techniques and tools; Development and testing techniques. Students will be introduced to the full embedded system design process including: analysis, design (using extended finite state machine specification), interfacing, programming, hardware assembly, integration and system testing. Selected design examples with a specific microprocessor, and the other with a specific microcontroller.	

Prerequisite (s)	EED329
Textbook	Julio Sanchez and Maria P. Canton, "Microcontroller programming: The Microchip PIC", CRC Press, Taylor & Francis Group, USA, 2018
Lab./Computer work/Project	**Exp. 1**: Basic programming examples using assembly language of the memory Interface with a specific microprocessor. **Exp. 2**: Programming of basic I/O Interface with a specific microcontroller. **Course Project**: Design and implementation of a suggested application on either a specific microprocessor or a specific microcontroller by the instructor.

MEC423	**Digital Control**	**3 CH (2,2,0)**
Course Contents	Discrete-time signals and systems; z-Transform analysis; Pulse transfer function and discrete-time feedback system; Static error, Jury stability test, and system sensitivity; Frequency-domain and state space analysis and design of discrete-time systems using MATLAB; Digital controller implementation issues (LABVIEW).	
Prerequisite (s)	MEC322	
Textbook	M. Sami Fadali "Digital Control Engineering: Analysis and Design" Academic Press, 2018.	
Lab./Computer work/Project	**Exp. 1**: Introduction to LABVIEW. **Exp. 2**: Familiarization with NI Data Acquisition. **Exp. 3:** Test the system stability using LABVIEW. **Exp.4:** Determine the system steady state error using LABVIEW. **Exp.5:** Design and Implement Digital Control using LABVIEW.	

MEC425	**Energy Storage Systems**	**3 CH (2,2,0)**
Course Contents	Energy storage systems: Types(Mechanical, Thermal, Chemical and Electro-chemical etc.), Importance, Theory of operation, Governing equations, Analyses, Advantages and Limitations.Applications range (i.e., small vs. large-scale applications) of energy storage systems. Selection of energy storage systems based on required energy stored and economical considerations. Combining the energy storage system with different energy systems either conventional or renewable energy based power plants.	
Prerequisite (s)	MEC244	
Textbook	- Mehmet Kanoglu, Yunus Cengel and John Cimbala, Fundamentals and Applications of Renewable Energy, McGraw-Hill, 2020.	
Lab./Computer work/Project	- Small projects to improve the design of energy storage systems for increasing their capability to store more energy (i.e. increasing their stored energy density) - Research projects about problems related with energy storage systems.	

MEC429	**Vibration and Condition Monitoring**	**3 CH (2,2,0)**
Course Contents	Introduction to Vibration Practical Application and major applications, Vibration Principles, Vibration Control, Vibration Isolation Fault detection techniques, Vibration as a Fault detection and diagnosis technique, Vibration Measurements and analysis, use of Vibration as a machinery condition monitoring.	
Prerequisite (s)	MEC331	
Textbook	Thomson, W. T. (2020). Vibration Monitoring of Induction Motors: Practical Diagnosis of Faults Via Industrial Case Studies. United Kingdom: Cambridge University Press, 2020.	
Lab./Computer work/Project	Exp. 1: Free Vibration Testing Exp. 2: Passive Damping System Exp. 3: Active Damping System	

MEC431	**Fluid Power Control**	**3 CH (2,2,1)**

Course Contents	Definition of fluid systems (Hydraulic and pneumatic) - Energy and power in hydraulic and pneumatic systems- Hydraulic Pumps and motors (gear, vane, piston,) – pump selection – pump performance – Actuating Cylinders- Control valves (directional, pressure, flow, servo & proportional control valves)- Memory circuit – Delay circuit - Sequence diagram –Applied circuits in electro hydraulics & electro pneumatics for direct and indirect control.
Prerequisite (s)	MEC232
Textbook	N. p., Fluid Power Systems. EduGorilla Publication, 2024.
Lab./Computer work/Project	**Exp. 1**: Memory circuit. **Exp. 2**: Pneumatic Delay circuit. **Exp. 3**: Speed control of a double acting cylinder. **Exp. 4**: Impulse valve circuit for controlling a double acting cylinder. **Exp. 5**: Automatic reversal of a single-acting cylinder by means of a limit switch. **Exp. 6**: Automatic reversal of a double-acting cylinder by means of limit switches. **Exp. 7**: Electro-pneumatic coordinated motion control for the sequence of motion of two double-acting cylinders.

MEC432	**Intelligent Fault Diagnosis Systems**	**3 CH (2,2,0)**
Course Contents	The Diagnostic Framework, Historical Data Diagnostic Methods, Data-Driven Fault Classification and Decision Making, Dynamic Systems Modeling, Physical Model–Based Methods, Model-Based Reasoning, Case-Based Reasoning (CBR), Other Methods for Fault Diagnosis, A Diagnostic Framework for Electrical/Electronic Systems, Model-Based Prognosis Techniques, Probability-Based Prognosis Techniques, Data-Driven Prediction Techniques, Case Study: Vibration-Based Fault Detection and Diagnosis for Engine Bearings	
Prerequisite (s)	MEC352	
Textbook	Shafiullah, Md, et al. Power System Fault Diagnosis: A Wide Area Measurement Based Intelligent Approach. Netherlands, Elsevier, 2022. Lei, Yaguo. Intelligent Fault Diagnosis and Remaining Useful Life Prediction of Rotating Machinery. United Kingdom, Butterworth-Heinemann, 2016.	
Lab./Computer	N/A	

MEC433	**Water Desalination Systems**	**2 CH (1,2,0)**
Course Contents	Introduction; Resources and need for water desalination, composition of seawater. Processes widely used in industry. Single effect evaporation; evaporators, vapor Compression. Multiple effect evaporation; developments in multiple effect evaporation. Multi Stage Flash Distillation MSF; developments in MSF. Reverse Osmosis RO; elements of membrane separation. Need for pretreatment processes in RO. Associated processes.	
Prerequisite (s)	MEC344	
Textbook	Removal of Pollutants from Saline Water: Treatment Technologies. N.p., CRC Press, 2021. Hisham T. El-Dessouky and Hisham M. E., "Fundamentals of SaltWater Desalination", Elsevier Science, latest Edition.	
Lab./Computer work/Project	Research projects to design different water desalination systems and improve their performance.	

MEC435	**Internal Combustion Engines**	**3 CH (2,2,0)**
Course Contents	Definitions, Classification of I.C.E. The fuel -air standard cycle, Deviations between the actual cycle and fuel-air standard cycle, Combustion in S.I.E. and C.I.E., Fuel properties, Friction loss, Engine performance at constant/variable speeds and constant load, Effect of engine speed on friction loss, Properties, classification and testing of engine lubricating oil, Oil filters, Cooling loss, Engine cooling systems, actual thermal cycle. Sources of pollutant emissions and the methods of reducing them.	

Prerequisite (s)	MEC244
Textbook	- Internal Combustion Engines: Performance, Fuel Economy and Emissions. United Kingdom, Woodhead Publishing, 2014.
Lab./Computer work/Project	**Exp. 1:** Test For Constant Speed Diesel Engine, Performance at Different Loads, Power, Thermal Efficiency, Specific Fuel Consumption. **Exp. 2:** Test For Variable Speed Spark ignition Engine Performance at Constant Throttle Opening, Power, Torque, Thermal Efficiency, Specific fuel consumption, F/ A Ratio.

MEC436	Power Plant Technology	3 CH (2,2,0)
Course Contents	Improvements in Rankine cycle to increase its thermal efficiency, Water tube boilers, Fire tube boilers, Condensers, Heat recovery boilers, Deareators and feed water heaters, Economizers, Superheaters, Air heaters, Steam pipes and steam traps cooling towers, Co-generation plants.	
Prerequisite (s)	MEC244	
Textbook	M. M. El-Wakil, “Powerplant Technology”, McGraw Hill, 2014.	
Lab./Computer	N/A	

MEC437	Artificial Intelligence for Robotics	3 CH (2,2,0)
Course Contents	Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents. Planning with forward and backward State space search – Partial order planning – Planning graphs– Planning with propositional logic. Uncertainty – Probabilistic reasoning–Filtering and prediction–Hidden Markov models–Kalman filters– Dynamic Bayesian Networks, Speech recognition, making decisions. Forms of learning – Knowledge in learning – Statistical learning methods –reinforcement learning. Robotic perception, localization, mapping- configuring space, planning uncertain movements.	
Prerequisite (s)	-	
Textbook	Govers, Francis X.. Artificial Intelligence for Robotics: Build Intelligent Robots that Perform Human Tasks Using AI Techniques. Germany, Packt Publishing, 2018. Murphy, Robin R.. Introduction to AI Robotics. United Kingdom, MIT Press, 2019.	
Lab./Computer	N/A	

MEC438	Process Planning and Cost Estimation	3 CH (2,2,0)
Course Contents	PROCESS PLANNING: Types of production, standardization, simplification, production design and selection - Process Planning, selection and analysis – Steps involved in manual and experienced based planning and computer aided process planning – Retrieval, Generative – Selection of process analysis – Break even analysis. ESTIMATION AND COSTING: Aim and objective of cost estimation – Functions of estimation – Costing – Importance and aims of costing – Difference between costing and estimation. Importance of realistic estimates – Estimation procedure. MACHINING TIME ESTIMATION: Estimation of Machining Timefor Lathe operations – Estimation of Machining TimeforDrilling, Boring, Shaping, Planning, Milling and Grinding operations - Illustrative examples.	
Prerequisite (s)	-	
Textbook	Allison, Diana. Estimating and Costing for Interior Designers: A Step-by-Step Workbook. Philippines, Bloomsbury Academic, 2014.	
Lab./Computer	N/A	

MEC439	Machine Learning	3 CH (2,2,0)

Course Contents	Introduction to Machine Learning, Introduction to Data Science and its Applications, Exploratory Data Analysis (EDA) using Pandas and NumPy, Data Visualization using Matplotlib, Seaborn, Data Engineering and Preprocessing, Web Scraping, Supervised Learning – Regression, Supervised Learning – Classification, SVM, KNN & Naive Bayes, Ensemble Methods and Boosting, Unsupervised Learning – Clustering, Unsupervised Learning – Dimensionality Reduction, Model Evaluation and Hyperparameter Tuning, Natural Language Processing (NLP)
Prerequisite (s)	EMP115
Textbook	Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, "An Introduction to Statistical Learning with Applications" Springer, New York, 2013.
Lab./Computer	N/A

MEC441	**Photovoltaic Systems**	**3 CH (2,3,0)**
Course Contents	Introduction to renewable and historical overview, Functioning of the photovoltaic cells Efficiency of solar cells, Types of solar photovoltaic cells, Energy depreciation of photovoltaic cells, Photovoltaic system types, conversion and specifications, Charge regulators, Power factor Energy, Network-connected photovoltaic systems (on-grid), Network-connected home systems (possibility for own consumption), Network-connected solar power plants (farms), Standalone systems (off-grid) or isolated systems, Hybrid systems, Independent, . systems for economic purposes.	
Prerequisite (s)	MEC349	
Textbook	- Abtahi, Amir; Messenger, Roger, Photovoltaic Systems Engineering, CRC Press, 2017.	
Lab./Computer	N/A	

MEC442	**Refrigeration and Air-Conditioning Technology**	**3 CH (2,2,0)**
Course Contents	Refrigeration history and fundamentals, basic refrigeration cycles and applications. Vapor compression cycle theory; performance of single stage and multi-stage vapor compression systems. Vapor absorption cycle theory, refrigerants classification and environmental impact. Properties of air using Psychometric chart and equations, air conditioning processes, load estimation. Air conditioning systems, air handling units and duct design.	
Prerequisite (s)	MEC231	
Textbook	- HALDER, GOPINATH. Introduction to Chemical Engineering Thermodynamics. India, PHI Learning, 2014. - C. P. Arora, Refrigeration and Air Conditioning, 3rd Edition, McGraw-Hill.	
Lab./Computer work/Project	**Exp. 1:** Performance evaluation of vapor compression refrigeration unit **Exp. 2:** Operation of air handling unit	

MEC443	**Bioenergy Systems**	**3 CH (2,2,0)**
Course Contents	Bioenergy systems and biomass energy, use of organic materials (Plants etc..), transfer of solid material to gas. Gas collection technologies , study of burning and digestion of wet wastes. use of biomass as a source of renewable energy.	
Prerequisite (s)	MEC349	
Textbook	-Yuan, Zhenhong , Bioenergy : principles and technologies, Science Press Ltd : Walter de Gruyter, 2018.	
Lab./Computer	N/A	

MEC444	**Hydraulic and Wave Energy**	**3 CH (2,2,0)**

Course Contents	Fluids and Fluid flow, Hydraulic and air system implementations, Installation and modelling of principles of performance, function and applications of hydraulic and air component, Valves, cylinders and pumps, linear and circular motion control circuits, design principles and implementation in hydraulic and air systems. Systems and devices of hydraulic energy generation, the transfer and control of energy, drawing and installation, Circuit and hydraulic systems, Performance improvements for the systems in Industrial processes
Prerequisite (s)	MEC349
Textbook	- R. Bhattacharyya and M.E. McCormick, Wave Energy Conversion, Elsevier, 2014.
Lab./Computer	N/A

MEC445	**Fuel Cell Technology**	**3 CH (2,2,0)**
Course Contents	Fuel cell kinetics and catalysis – Fuel cell materials and operational –Fuel cell types and applications – Calculating output voltage – Calculating maximum output voltage – Effect of temperature and operating pressure on output voltage- Geo-political, social, and environmental aspects.	
Prerequisite (s)	-	
Textbook	Ryan O’Hayre, Suk-Won Cha, Whitney Colella, and Fritz B. Prinz, “Fuel Cell Fundamentals”, 3rd Edition, Wiley, 2016	
Lab./Computer	N/A	

MEC446	**Energy Conversion and Efficiency**	**3 CH (2,2,0)**
Course Contents	Fundamentals of thermodynamics, chemistry, and transport applied to energy systems. Topics include analysis of energy conversion and storage in thermal, mechanical, chemical, and electrochemical processes in power and transportation systems, with emphasis on efficiency, performance, and environmental impact. Applications include fuel reforming and alternative fuels, hydrogen, fuel cells and batteries, combustion, catalysis, combined and hybrid power cycles using fossil, nuclear and renewable resources.	
Prerequisite (s)	-	
Textbook	D. Yogi Goswami, Frank Kreith, “Energy Conversion.” United States, CRC Press, 2017.	
Lab./Computer	N/A	

MEC447	**Nuclear Power Stations**	**3 CH (2,2,0)**
Course Contents	Introduction to nuclear energy- atomic and nuclear physics- interaction of radiation and matter- nuclear reactor operation- reactor components- nuclear cycles- neutron diffusion and moderation- Prompt and delayed neutrons – Design of reactor core – Effect of reflector on fuel saving – Heat transfer calculations across fuel rod and coolant - Reactor shielding- Fuel reprocessing and waste disposal- Reactor licensing and safety- Economics and environmental concerns.	
Prerequisite (s)	-	
Textbook	Dean Kyne, “Nuclear Power Plant Emergencies in the USA: Managing Risks, Demographics and Response”, 1st Edition, Springer, 2017. Rüdiger Meiswinkel, Julian Meyer, Jürgen Schnell, “Design and Construction of Nuclear Power Plants”, 1st Edition, Ernst & Sohn, 2013.	
Lab./Computer work/Project	Mini Project	

MEC448	**Energy Environment Impact**	**3 CH (2,2,0)**

Course Contents	Applications of chemistry and engineering fundamentals to understand environmental concepts related to human activities, mass and energy transfer, environmental chemistry for water and air pollution, Pollution management and hazard evaluation, introduction to chemical, physical and biological related to quality of water, air and earth environment, parameters that effect energy consumption and building utilization, basic resources and utilization of energy. Energy conversions, distribution and utilization of electricity and heat, environment impact of energy technology
Prerequisite (s)	-
Textbook	Anji Reddy Mareddy, Environmental Impact Assessment, Theory and Practice, 1st Edition, ISBN: 9780128111390, 2017.
Lab./Computer	N/A

MEC461	**Engineering Economics**	**2 CH (2,0,0)**
Course Contents	Introductory finance: time value of money, cash flow analysis. Investment evaluation methods: present worth, annual worth and internal rate of return, Depreciation models and asset replacement analysis, the impact of inflation, taxation, uncertainty and risk on investment decisions.	
Prerequisite (s)	-	
Textbook	. "Engineering Economy" , Leland Blank, Anthony Tarquin McGraw Hill (Latest Edition)	
Lab./Computer work/Project	Project: A group project where students should select an investment, which has multiple mutually exclusive alternatives. In selecting the preferred alternative, the group must use the different principles of engineering economic analysis learned in the course. Every group is required to submit a technical report and provide an oral presentation	

MEC465	**Power electronics and drive systems**	**2 CH (1,2,0)**
Course Contents	Power diodes, Power switching devices such as BJTs, IGBTs, MOSFETs, IGCTs, MCTs and GTOs, Uncontrolled and controlled rectifiers, Inverters. Servomotors: brushed DC and brushless DC motors (BLDC). Synchronous machines. Power electronic devices and converters: choppers, inverters, cycloconverters, and switched power supplies. Electric drives: torque and speed control. Trapezoidal, sinusoidal, and field-oriented (vector) control of BLDC motors. Stepper motors: unipolar, bipolar, and micro stepping motor drives. Computer simulations (MATLAB SIMULINK).	
Prerequisite (s)	EED219	
Textbook	Muhammad H. Rashid "Power Electronics: Circuits, Devices and Applications" Latest Edition	
Lab./Computer work/Project		

MEC471	**Robotics**	**3 CH (2,2,0)**
Course Contents	Robot definition and classification based on geometrical configuration. Robot application and trends. Terminologies in robotics. Rigid motion and coordinate system description. Coordinate rotation and translation by Homogenous matrix. Denavit-Hartenberg convention and parameters, Forward kinematics, Inverse kinematic analysis, Jacobean matrix and velocity and dynamic analysis. Path and trajectory planning, path analysis and path optimization.	
Prerequisite (s)	MEC356	
Textbook	- Spong, Mark W., et al. "Robot Modeling and Control". United Kingdom, Wiley, 2020.	

Lab./Computer work/Project	Team project for students to make an idea of their own designing a robot system based on real society needs. (may be given hint by instructor). The objective is to apply all relevant material studied in lecture to their specific project, regarding the specification such as workspace, DOF, accuracy, precision. They should also derive the forward kinematics model using DH convention and table, then solve for inverse kinematics and trajectory planning. Building a real model will be a plus but not mandatory.

MEC472	**Industrial Automation Technology (CAD/CAM)**	**3 CH (2,2,0)**
Course Contents	Computer assisted manufacturing systems NC, CNC, DNC, robotics, material handling, group technology, flexible manufacturing systems, process planning and control. Scope and utilization of CAM- data bases needed for manufacturing – languages- for CAM- integration between CAD and CAM- software and applications. How to implement the right industrial robot system for a plant.	
Prerequisite (s)	MEC352	
Textbook	. M. Groover, CAD/CAM Computer aided design and manufacturing, Prentice Hall	
Lab./Computer work/Project	**Exp. 1**: Solid Works Basics **Exp. 2**: Solid Works Manufacturing **Exp. 3**: CAM Works	

MEC473	**Reverse Engineering in Mechanical Engineering**	**3 CH (2,2,0)**
Course Contents	Reverse Engineering Process. Methodologies and Techniques for reverse engineering. Reverse Engineering Hardware and software. Selection of a reverse engineering systems. Rapid Prototyping Processes. Relationship between reverse engineering and rapid prototyping. Reverse Engineering application in different industries.	
Prerequisite (s)	-	
Textbook	Raja V., and Fernandes, K.J., “Reverse Engineering: An Industrial Approach”, Springer-Verlag	
Lab./Computer work/Project	A group project where students should select a mechanical product, which is composed of more than one part. The groups are required to digitize the product by generating the point cloud and consequently generate the CAD files for the product. The group is required to induce a change in the part and generate the corresponding CAD files for all the product parts. Every group is required to submit a technical report and provide an oral presentation.	

MEC474	**Plant Engineering an Maintenance**	**3 CH (2,2,0)**
Course Contents	Introduction to Plant Engineering in industrial application. Definition of Modern maintenance and its objectives. Maintenance Types and Strategies used in Modern Industries. Economic consideration in Plant Engineering and Maintenance. Condition Based Maintenance (CBM). Computer Maintenance Management Systems (CMMS).	
Prerequisite (s)	MEC352	
Textbook	Dhillon, B.S "Engineering Maintenance: A Modern Approach", CRC Press (ISBN 1-58716-142-7).	
Lab./Computer	N/A	

MEC475	**Industrial Robotics and Material Handling Systems**	**3 CH (2,2,0)**
Course Contents	Types of industrial robots, Load handling capacity, Robotic vision systems, image representation, object recognition and categorization, depth measurement, image data compression, visual inspection, software considerations, Gripper force analysis and gripper design, design of multiple degrees of freedom, active and passive grippers. SELECTION OF	

	ROBOT: Factors influencing the choice of a robot, robot performance testing, economics of robotisation, Impact of robot on industry and society, Concepts of material handling, principles and considerations in material handling systems design, conventional material handling systems - industrial trucks, monorails, rail guided vehicles, conveyor systems, cranes and hoists, advanced material handling systems, automated guided vehicle systems, automated storage and retrieval systems(ASRS), bar code technology, radio frequency identification technology.
Prerequisite (s)	MEC437
Textbook	.
Lab./Computer	N/A

MEC476	**Wireless Sensors Networks for Robotics**	**3 CH (2,2,0)**
Course Contents	Overview of wireless sensors networks, Single-Node architecture; Hardware Components, Energy Consumptions if sensor nodes, operating systems and execution environments. Network Architecture; Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts. Networking Sensors; Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts. Infrastructure Establishment; Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.	
Prerequisite (s)	-	
Textbook	.	
Lab./Computer	N/A	

MEC477	**Computer Aided Design**	**3 CH (2,2,0)**
Course Contents	Synthesis of planar and spatial mechanisms. Computer based kinematics and dynamic analysis of mechanisms and systems. Computer aided stress analysis and design optimization of mechanical systems. System simulation tools and its merits and limitations. Mini-project on modeling and simulation of a practical case. Overview of rapid and virtual prototyping software tools.	
Prerequisite (s)	MEC352	
Textbook	Computer-aided Engineering Design With Solidworks, By Godfrey C Onwubolu, World Scientific Publishing Company	
Lab./Computer work/Project	**Exp. 1**: SolidWorks parametric design **Exp. 2**: Solid Works Assembly **Exp. 3**: Project modeling.	

MEC478	**Autonomous systems**	**3 CH (2,2,0)**
Course Contents	An introduction to the perception, orientation, cognition, decision and motion control featured in autonomous systems. Operating principles of motion sensing, sensor fusion, state estimation, localisation, modelling and control of autonomous vehicles, and the theory and applications of control algorithm of autonomous operations. Integration of sensors, motion sensing and motion control of autonomous vehicles. Utilization of suitable software such as ROS , RVIZ and Gazebo ...etc.	
Prerequisite (s)	-	
Textbook	Levent Güvenç "Autonomous Road Vehicle Path Planning and Tracking Control" Wiley, 2021.	
Lab./Computer	Exp1: ROS Essentials, Introduction to ROS Topics, Services, Actions and Nodes. Simple	

work/Project	interaction with the course simulation environment. Exp 2: Build your own robot environment Software representation of a Robot using Unified Robot Description Format (URDF), ROS parameter server and adding real-world object representations to the simulation environment. Exp 3: Autonomous Navigation Map creation with GMapping package, autonomously navigate a known map with ROS navigation. Exp 4: Manipulation Motion planning, pick and place behaviors using industrial robots with ROS MoveIt! Exp 5: Robot Vision, Object detection, pose estimation. Exp 6: Final Project

MEC479	**SCADA Systems**	**3 CH (2,2,0)**
Course Contents	Gain knowledge on how to operate, configure and program SCADA systems following standards and their application in industrial plants. Familiarization with industry communication protocols for data exchange with a SCADA system and various topologies of SCADA system performance. Application of industrial tools for designing SCADA systems and creating projects using them	
Prerequisite (s)	-	
Textbook	Liam Bee "PLC and HMI Development with Siemens TIA Portal Develop PLC and HMI Programs Using Standard Methods and Structured Approaches with TIA Portal V17" Packt Publishing, 2022.	
Lab./Computer work/Project	Exp. 1: Activity on configuration of HMI device with PLC. Exp. 2: Activity on creating screens and objects. Exp. 3: Activity on Dynamic Screen. Exp. 4: Activity on Configure communication with PLC.	

MEC494	**Special Topics in Mechatronics-1**	**3 CH (2,2,0)**
Course Contents	The course content, related to Mechatronics Engineering, will be approved by the department council to allow flexibility in response to rapidly changing market needs.	
Prerequisite (s)	As advised	
Textbook	As advised	
Lab./Computer	As advised	

MEC495	**Special Topics in Mechatronics-2**	**3 CH (2,2,0)**
Course Contents	The course content, related to Mechatronics Engineering, will be approved by the department council to allow flexibility in response to rapidly changing market needs.	
Prerequisite (s)	As advised	
Textbook	As advised	
Lab./Computer	As advised	

MEC496	**Special Topics in Sustainable Energy-1**	**3 CH (2,2,0)**
Course Contents	The course content, related to Sustainable Energy, will be approved by the department council to allow flexibility in response to rapidly changing market needs.	
Prerequisite (s)	As advised	
Textbook	As advised	
Lab./Computer	As advised	

MEC497	Special Topics in Sustainable Energy-2	3 CH (2,2,0)
Course Contents	The course content, related to Sustainable Energy, will be approved by the department council to allow flexibility in response to rapidly changing market needs.	
Prerequisite (s)	As advised	
Textbook	As advised	
Lab./Computer	As advised	

MEC498	Graduation Project 1	2 CH (1,0,3)
Course Contents	A capstone project. It is an application oriented and requires the use of engineering principles to the solution of a real-world problem. In phase 1, a team of students (2-4) is attached to one or more faculty members as advisor(s). A topic related to Mechatronics engineering is to be selected in accordance to interest of both the student and the advisor. This topic is preferred to be linked with a real problem in industry. During this phase, the following tasks are to be fulfilled: A proposal with suggested time plan – Review of the available literature including web search of the related subjects- Design stage. The supervisor evaluates the contribution of each student at the end of this phase which lasts one semester.	
Prerequisite (s)	Approval	
Textbook	As advised	
Lab./Computer	As advised	

MEC499	Graduation Project 2	3 CH (1,0,6)
Course Contents	In phase II of the graduation project, the student(s) build on their achievements in phase I to finalize the fulfilment of the task(s) assigned. This phase includes: finalizing of the design stage – Implementation (computer simulation and/or hardware realization) – Testing and finishing -Writing of the thesis. The duration of this phase is one semester in addition to extra four weeks. The student(s) are to present their work in front of an examination board for evaluation. At least one member of the examination board is an external examiner from industry or from other university.	
Prerequisite (s)	MEC498	
Textbook	As advised	
Lab./Computer	As advised	

10F. Petroleum Engineering Course Descriptions

PETxxx Courses

PET211	Introduction to Petroleum Engineering 3 CH (2,3,0)
Course Contents	Overview of Oil and Gas Resources. International Petroleum organizations, Origin of petroleum. Basic Review of Petroleum Traps. Migration and Accumulation. Basic Functions and Components of Rig. Drilling Fluid Functions. Fundamental Drilling Operations. Completion Types. Completion Equipment. Definitions of Reserves. Reservoir Drive Mechanisms. Primary Recovery. Petroleum Fraction. Different Petroleum Products. Petroleum oilfield Safety.
Prerequisite (s)	--
Textbook	1. X. Shen, M. Bai, W. Standifird: “Drilling and Completion in Petroleum Engineering ”, 1st ed., Taylor & Francis, 2011 2. F. Jahn, M. Cook, M Graham: “Hydrocarbon Exploration and Production”, 2nd ed., Elsevier Publishing, 2008
Lab/Computer work/Project	--

PET212	Drilling Engineering I 3 CH (2,2,1)
Course Contents	Systems of units. Fundamentals of rock mechanics. Down hole pressure and temperature relations. Drill string design. Hosting system. Rotary drilling bits (Tricone bits, PDC bits, Diamond bits). Bit selection. Mud engineering: Functions, Types, Properties, Calculations, and Conditioning. Rig hydraulics. Mud lab Experiments.
Prerequisite (s)	PET211
Textbook	1. R. F. Mitchell, S. Z. Miska: “Fundamentals of Drilling Engineering”, 1st ed., SPE Textbook, 2011 2. E. Fjaer, R. M. Holt, P. Horsrud, A. M. Raaen: “Petroleum Related Rock Mechanics”, 2nd edition, Elsevier, 2008
Lab/Computer work/Project	Drilling Fluids Lab Software for design

PET241	General Geology 2 CH (2,0,0)
Course Contents	Cosmology and Earth formation. Mineralogy: different rock types. Sedimentary processes. Volcanoes. Geologic time. Plate tectonics and crustal deformation. Earthquakes. Surface processes of erosion. Weathering in different geologic environments.
Prerequisite (s)	--
Textbook	1. E. J. Tarbuck, F. K. Lutgens, D. G. Tasa: “Earth: An Introduction to Physical Geology”, 13th ed., Pearson Publication, 2019 2. A. Parriaux: “Geology-Basics for Engineers”, 2nd ed. Taylor & Francis, 2018
Lab/Computer work/Project	--

PET242	Structural Geology & Sedimentology 3 CH (2,2,0)
Course Contents	Introduction to structures formed by brittle and ductile deformation. Structures in terms of geometrical, kinematical, mechanical analysis. Stereo net practice, stress and strain analysis, fractures and faults, folding, diapirism, shear zones, deformation mechanisms. Analysis and interpretation of seismic, Sea floor image, Well logs, Characteristics of the elements of reservoirs and emphasizing internal architecture as related to reservoir performance. Geologic control on reservoir equality. New concepts in understanding transport and depositional processes. Geologic modeling and petroleum systems.
Prerequisite (s)	PET241
Textbook	1. D. D. Pollard, R. C. Fletcher: "Fundamentals of Structural Geology", Cambridge University Press, 2005 2. G. Shanmugam: "Deep-Water Processes and Facies Models Implications for Sandstone Petroleum Reservoirs", 1st ed., Elsevier, 2006 3. R. M. Slatt: "Stratigraphic Reservoir Characterization for Petroleum Geologists, Geophysicists, and Engineers", 2nd ed., Elsevier, 2013
Lab/Computer	--

PET314	Drilling Engineering II 3 CH (2,2,1)
Course Contents	Pore pressure. Fracture gradient. Casing seat selection. Casing design. Cementing. Well completion. Factors affecting rate of penetration. Hole problems. Directional holes. Fishing. Offshore drilling.
Prerequisite (s)	PET212
Textbook	1. R. F. Mitchell, S. Z. Miska: "Fundamentals of Drilling Engineering", 1st ed., SPE Textbook, 2011 2. M. E. Hossain, M. R. Islam: "Drilling Engineering Problems and Solutions" 1st ed., Wiley, 2018
Lab/Computer work/Project	Cementing Lab Software for design

PET321	Production Optimization and Well Performance 3 CH (2,2,0)
Course Contents	Introduction to the producing wellbore system. Inflow performance relationships. Effect of formation damage on well flow. Nodal systems analysis. Perforating methods and their effect on inflow. Stimulation treatments to enhance well performance. Introduction to well completions. Diagnostics and well servicing. Overview of production systems.
Prerequisite (s)	PET211
Textbook	1. H. D. Beggs: "Production Optimization Using Nodal Analysis", 2nd ed., Oil & Gas Consultants Intl., 2002 2. Dowell –Schlumberger, "Well performance Manual", 1998 3. Kermit E. Brown, and H. D. Beggs: "Technology of Artificial lift Methods" Vol. 1, PennWell Books, 1980
Lab/Computer	--

PET322	Artificial Lift Technology 3 CH (2,2,0)
Course Contents	Study of artificial lift methods used to produce liquids (oil/water) from wellbores. Methods covered include sucker rod (piston) pumps, electric submersible pumps, gas lift, hydraulic lift and plunger lift
Prerequisite (s)	PET321
Textbook	1. N. K. Mitra, A. Kumar: "Principle of Artificial lift", Allied Publishers Pvt, Ltd., 2012 2. Kermit E. Brown, and H. D. Beggs: "Technology of Artificial lift Methods" Vol. 1,

	PennWell Books, 1980
Lab/Computer	--

PET324	**Well Completion and Workover 3 CH (2,2,0)**
Course Contents	Fundamentals and applications of completion and workover operations: Various completion designs, Reservoir and mechanical considerations, Basic tubing design, Subsurface equipment, Completion and workover fluids, Perforating, stimulation, Sand control and remedial cementing. Horizontal well completion technology. Completion and workover problem solving, and demonstration of the design and operation of basic completion and control equipment.
Prerequisite (s)	PET314
Textbook	1. J. Beilarby: “Well Completion Design” 1st ed., Elsevier Science,2009 2. W. Renpu: “Advanced Well Completion Engineering”, 3rd ed., Gulf Professional Publishing (imprint of Elsevier), 2011
Lab/Computer	--

PET331	**Reservoir Rock and Fluids Properties 3 CH (2,2,1)**
Course Contents	Basic petrophysical properties of reservoir rocks: Porosity, Permeability, Fluid saturation, Electrical conductivity, Capillary pressure, and Relative permeability. Laboratory measurement of the reservoir rock characteristics mentioned above. Physical properties of petroleum fluids: Chemical components of petroleum fluids, Elementary phase behavior, Calculations of the physical properties of gases, liquids, and gas-liquid mixtures in equilibrium. Principles of miscibility.
Prerequisite (s)	PET211
Textbook	1. D. Tiab, E. C. Donaldson: “Petro physics: Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties”, 3rd ed., Gulf Professional Publishing, 2012 2. W. D. McCain: “The Properties of Petroleum Fluids”, 2nd ed., PennWell Publishing Company, 1990
Lab/Computer work/Project	Porosity Lab Measurements Permeability Lab Measurements Relative Lab Measurements Capillary pressure Lab Measurements Wettability Capillary pressure Lab Measurements PVT Lab Phase behaviors of the petroleum fluids PVT Lab Types of reservoir fluids.

PET332	**Petroleum Reservoir Engineering 3 CH (2,2,0)**
Course Contents	Quantitative study of oil production by natural forces, Gas cap, Water influx, Solution gas, etc. Material balance equations, study of gas, and black oil reservoirs. Predictive calculations of oil recovery from different reservoir types. Principles of immiscible displacement.
Prerequisite (s)	PET331
Textbook	1. T. Ahmed and P. D. McKinney: “Advanced Reservoir Engineering”, Gulf Professional Publishing (imprint of Elsevier), 2005 2. B.C. Craft and M.F. Hawkins: “Applied Petroleum Reservoir Engineering”, 2nd ed., Revised by R. Terry, Prentice Hall PTR, 1991 3. L.P. Dake: “Fundamentals of Reservoir Engineering”, Elsevier Science B.V., 1998
Lab/Computer	--

PET333	Formation Evaluation with Well Logging 3 CH (2,2,1)
Course Contents	Introduction to formation evaluation, coring and core analysis, drilling fluid and cuttings analysis, mud logging, well logging and other evaluation methods. Theory and interpretation of conventional well logs, electric resistivity of rocks, measurements zones and environments, open hole logging; spontaneous potential log, gamma ray logs, resistivity logs; conventional electric tools, focused current and induction devices, sonic log, density logs, and neutron logs.
Prerequisite (s)	PET331
Textbook	1. T. Darling: "Well Logging and Formation Evaluation", Gulf Professional Publishing, 2005 2. G. Asquith, D. Krygowski: "Basic Well Log Analysis", 2nd ed., AAPG Publications, 2006 3. Z. Bassouni: "Theory, Measurement and Interpretation of Well Logs", 2nd ed., SPE Textbooks, 1994
Lab/Computer work/Project	Software lab for well log interpretation and formation evaluation

PET343	Petroleum Geology and Exploration 3 CH (2,2,0)
Course Contents	Fundamentals of petroleum geology. Source rock and reservoir, trap types. Generation, migration and accumulation of petroleum. Effects of sedimentary environments on reservoir rock properties. Mapping and geological correlations. Concepts and Geo-statistics. Geotectonic effects on frac. Geophysical tools integrated with geology. Correlation principles and exercise, sequence stratigraphy primer and applications, principle of exploration and exploitation and examples. Exploration methods; seismic, gravity, magnetism. Appraisal methods, reservoir mapping and volumetric. Unconventional resources. Outline of the importance of oil and gas deposits in Egypt.
Prerequisite (s)	PET242
Textbook	1. R. C. Selley: "Elements of Petroleum Geology", 3rd ed, Elsevier Academic Press, 2015 2. R. M. Slatt: "Stratigraphic Reservoir Characterization for Petroleum Geologists, Geophysicists, and Engineers", 2nd ed., Elsevier, 2013
Lab/Computer	--

PET351	Petroleum Refining and Petrochemical Engineering 3 CH (2,2,0)
Course Contents	Distillation Columns. Crude oil fractionation. Basic petroleum fractions from AD/AV complex, Refinery Gases. Gasoline and Naphtha Specification and uses. Aviation Turbine Fuel. Kerosene, Fuel, and Asphalt specifications and uses. Wax distillates production. Manufacture of lubricating oils, and Grease. Complex refinery schemes: dehydration, desulphurization, Cracking, reforming Operations. Raw materials of petrochemical industries. Preparation of gaseous hydrocarbons, fractionation of gases. Preparation of liquid hydrocarbons. Separation of paraffin's, aromatics, xylenes. Syntheses and reactions of H2-CO2 mixture. Production of methanol, alcohols, ammonia, sulfur and sulfuric acid. Production of detergents, plastics and resins, synthetic rubber, and industrial fibers. Natural and properties of polymers.
Prerequisite (s)	EMP251
Textbook	1. J. H. Gary, G. E. Handwerk, M. J.: Kaiser: "Petroleum Refining: Technology and Economics", 5th ed., CRC Press, 2007 2. W. L. Nelson: "Petroleum Refinery Engineering", McGraw-Hill, New York, 1969
Lab/Computer	--

PET352	Natural Gas Engineering and Processing 3 CH (2,2,0)
Course Contents	Gas reserves: Estimation, Deliverability, and Future production performance prediction. Deliverability testing of gas wells: Isochronal, Flow after flow, Drawdown and buildup. Gas field development and underground storage. Gas production metering gauging and transmission. Properties of Natural Gases and Condensate Systems. Separation and Processing. Glycol Dehydration. Petrochemicals: Overview, Introduction, Process Topology, Manufacture of Methanol from Synthesis Gas, Formaldehyde and Chloromethane.
Prerequisite (s)	--
Textbook	1. H. D. Beggs: "Gas Production Operations", Oil & Gas Consultants Int, 1984 2. S. Mokhatab, W. A. Poe, J. Y. Mak:" Handbook of Natural Gas Transmission and Processing", 4th ed., Gulf Professional Publishing (imprint of Elsevier), 2019
Lab/Computer	--

PET361	Economics and Agreements 3 CH (2,2,0)
Course Contents	Introduction to the economic yardsticks. Economic analysis process for petroleum projects and the sensitivity analyses concept. Cashflow model and its components together with the net percent value consideration. Worldwide petroleum legislation such as Royalty, tax system, Production sharing, contracts, Concession Agreement, etc. Types of risks encountered in the petroleum industry and risk analysis. Introduction to E&P decision evaluation technique.
Prerequisite (s)	--
Textbook	1. H. K., Abdel-Aal, M. A. Alsahlawi: "Petroleum Economics and Engineering" 3rd ed., Taylor and Francis, 2013
Lab/Computer	--

PET415	Advanced Drilling Technology 3 CH (2,2,0)
Course Contents	Directional well planning and bottom hole assemblies. Hole problems and wellbore stability in deviated wells. Computer aided drilling optimization and drill bit selection for directional wells. Horizontal well drilling: reasons, types, design of well path, BHA design, drilling problems associated with horizontal wells. Optimized torque and drag during drilling horizontal wells. Instrumentation and mechanical aspects of steerable motors and their effect. Applications of coiled tubing and new equipment in horizontal drilling. Case histories of horizontal well drilling worldwide.
Prerequisite (s)	PET314
Textbook	1. R. Samuel, D. Gao: "Horizontal Drilling Engineering - Theory, Methods and Applications", Sigma Quadrant Publisher, 2014 2. M. E. Hossain, M. R. Islam: "Drilling Engineering Problems and Solutions "1st ed., Wiley, 2018 3. Drilling Manuals from Different Oil & Gas Companies Such as: Shell and ENI.
Lab/Computer	--

PET425	Surface Production Operations 3 CH (2,2,0)
Course Contents	Oil and Gas Gathering Systems: Onshore and Offshore Production Facility, Choosing a Process, Crude Oil Characteristics. Crude Oil Emulsion Problems: Theories of Emulsion, Emulsion Treatment Process and Equipment. Separation of Oil and Gas: Types of Separators and Capacities, Separator Design, Sizing and Selection. Oil Treatment Facilities: Desalting Units, Crude Oil Stabilization and Measurements, Classifications and Fraction of Crudes. Transportation of Crude Oil: Introduction, Pipelines, Pipeline Installation, Pipeline Maintenance, Chemical Treatment, Use of Pigs, Corrosion Control.

Prerequisite (s)	PET321
Textbook	1. M. Stewart, K. E. Arnold: “Surface Production Operations”, 3rd ed., Elsevier Science & Technology, 2011
Lab/Computer	--

PET433	**Well Testing Analysis 3 CH (2,2,0)**
Course Contents	Introduction to well testing, well test objectives, and overview of the diffusivity equation for well test analysis. Pressure buildup tests (PBU), PBU test analysis and design, fault detection, determination of average reservoir pressure. Draw down and reservoir limits test, design and implementation. Type curve matching and pressure derivatives. Multiple well testing; interference testing and pulse testing. Injection well testing; injectivity test; falloff test, step-rate test. Drill stem test. Design of well testing procedures analysis software.
Prerequisite (s)	PET332
Textbook	1. J. Lee: “Well Testing”, SPE Textbook, 1982 2. D. Bourdet: “Well Test Analysis”, Elsevier Science & Technology, 2002 3. T. Ahmed and P. D. McKinney: “Advanced Reservoir Engineering”, Gulf Professional Publishing (imprint of Elsevier), 2005
Lab/Computer	--

PET434	**Reservoir Simulation 3 CH (2,2,1)**
Course Contents	Introduction to petroleum reservoir simulation. Finite difference approximation of the partial differential equations of flow through porous media. Discussion of various simulation schemes, data handling, boundary conditions. Use of a dry gas and black oil simulators. Simulation of actual reservoir problems using both field and individual well models to determine well spacing, production effects of secondary and enhanced recovery processes. Future rate predictions and recovery, coning effects. Relative permeability adjustments and other history matching techniques.
Prerequisite (s)	PET332
Textbook	1. J. H. Abou-Kassem, S. M. F. Ali, M. R. Islam: “Petroleum Reservoir Simulation: A Basic Approach”, Gulf Publishing Company, 2006 2. M. R. Islam, M. E. Hossain, S. H. Mousavizadegan, S. Mustafiz, J. H. Abou-Kassem: “Advanced Petroleum Reservoir Simulation: Towards Developing Reservoir Emulators” 2nd ed., Wiley, 2016
Lab/Computer work/Project	Software lab for using reservoir simulators to build reservoir models and applications

PET435	**Enhanced Oil Recovery 3 CH (2,2,0)**
Course Contents	Oil recovery by water injection: Effects of wettability, Capillary pressure, Relative permeability, Mobility ratio on displacement, Sweep and recovery efficiencies. Piston-like and Buckley –Leverett methods for liner pattern and pattern water floods in single and multi-layered reservoir. Enhanced oil production methods: Chemical (Polymer, Surfactant, and alkaline flooding), Gas miscible displacement, and Thermal recovery for heavy oil.
Prerequisite (s)	PET332
Textbook	1. J. J. Sheng: “Modern Chemical Enhanced Oil Recovery, Theory and Practice”, Gulf Professional Publishing (an imprint of Elsevier) 2011. 2. E. C. Donaldson, G. V. Chilingarian, T. F. Yen: “Enhanced Oil Recovery II, Processes and Operations,” Elsevier science Publishers, 1989

	3. H. K. Van Poollen, et al.: “Fundamentals of Enhanced Oil Recovery,” Penn Well Publishing company, 1980
Lab/Computer	--

PET436	**Reservoir Characterization** **3 CH (2,2,0)**
Course Contents	Principles and techniques of petroleum reservoir characterization. Subsurface data from geological and engineering sources. Univariate and bivariate characterization Estimation techniques. Reserve estimation methods.
Prerequisite (s)	PET332
Textbook	1. R. A. Schatzinger, J. F. Jordan: “Reservoir Characterization: Recent Advances”, AAPG Publications, 1999 2. F. Amenzadeh: “Reservoir Characterization: Fundamentals and Applications”, Scrivener Publishing LLC, 2022
Lab/Computer work/Project	--

PET471	**Digital Applications in Petroleum Engineering** **3 CH (2,2,0)**
Course Contents	Applications of Windows-based Visual Basic solutions to engineering problems including selected topics in fluid flow: PVT behavior, Matrices in engineering solutions, Translating curves to computer solutions, Predictor-corrector material balance solutions, and Graphical display of results.
Prerequisite (s)	--
Textbook	As advised
Lab/Computer	--

PET472	**Greenhouse Technology and Emission Reduction** **3 CH (2,2,0)**
Course Contents	Technologies employed to reduce CO2, CH4, and soot emissions from energy utilization, Advantages and limitations of technologies applied to reduce energy emissions, Efficient use of energy, Catalytic conversion, Greenhouse challenges, Emerging greener technologies, Capture and storage of CO2, Emissions from nuclear power, Reforming, Sulphur and Sulphur scrubbers, Climate changes and greenhouse gases.
Prerequisite (s)	--
Textbook	As advised
Lab/Computer	--

PET473	**Energy Plant Engineering and Maintenance** **3 CH (2,2,0)**
Course Contents	Introduction to Plant Engineering in industrial application. Definition of Modern maintenance and its objectives. Maintenance Types and Strategies used in Modern Industries. Economic consideration in Plant Engineering and Maintenance. Condition Based Maintenance (CBM). Computer Maintenance Management Systems (CMMS). Plant engineering utilities, energy and power systems, Material handling and storage. Environmental control: Waste disposal, Pollution control. Industrial maintenance: Corrective and predictive maintenance, piping, Spare parts inventory control.
Prerequisite (s)	--

Textbook	B. S. Dhillon: “Engineering Maintenance: A Modern Approach”, CRC Press, 2002
Lab/Computer	--

PET474	**Geo-Energy Storage Systems 3 CH (2,2,0)**
Course Contents	Subsurface geological formations as storge systems for energy considerations. Geothermal energy recovery from abandoned petroleum wells. Technical factors: wellbore integrity, heat recovery technologies, subsurface influences on deep wellbore heat extraction. Practical consideration: heat exchangers, working fluids, thermal conductivity, corrosion, scaling, and remote operations. Challenges and opportunities: political motivation, regulations, environmental impacts, and economics. CO2 injection and storage/sequestration in subsurface geological formations: trapping mechanisms, petrophysical changes, monitoring techniques, environmental issues and economic considerations. CO2 injection for enhanced oil recovery.
Prerequisite (s)	--
Textbook	As advised
Lab/Computer	--

PET475	**Energy and Unconventional Resources 3 CH (2,2,0)**
Course Contents	Introduction to energy demand. Non-conventional energy resources and key performance characteristics. Comparison between conventional and unconventional resources. Unconventional oil and gas resources: Heavy oil, Low-permeability reservoirs, Coal bed methane, Gas hydrates. Classification of unconventional resources, geologic significance, geographic occurrences, petrophysical properties and formation evaluation, and recovery technology. Methods for hydrocarbon recovery: well drilling, well stimulation, hydraulic fracturing, and the overall geomechanical framework. Various methods for recovery and more advanced methods for improved oil recovery.
Prerequisite (s)	--
Textbook	1. C. Ngo: “Energy Resources, Technologies & The Environment”, Institution of Engineering and Technology, 2010 2. Y. Z. Ma and S. A. Holditch: “Unconventional Oil and Gas Resources Handbook Evaluation and Development”, Gulf Professional Publishing (an imprint of Elsevier), 2016 3. M. R. Islam: “Unconventional Gas Reservoirs: Evaluation, Appraisal and Development” Gulf Professional Publishing (an imprint of Elsevier), 2015
Lab/Computer	--

PET476	**Petroleum and Sustainability 3 CH (2,2,0)**
Course Contents	Introduction to the role of petroleum engineering in sustainability. Sustainable Developments Goals (SDGs) and relation to the oil and gas industry. Fundamentals and applications related to environmental sustainability and emerging energy resources. Environmental aspects of produced water disposal, mitigation of greenhouse gas emissions, reducing surface footprint, elimination spills, and applying environmentally friendly materials. Well integrity. Optimized field development and management. Energy efficiency and conservation.
Prerequisite (s)	--
Textbook	As advised
Lab/Computer	--

PET477	Selected Topics in Sustainable Energy 3 CH (2,2,0)
Course Contents	Selected topics in sustainability in energy. Problems or readings on specific subjects or projects in sustainability. Students will investigate cutting edge research in sustainable energy including experimental studies, current policies and international sustainability issues. Field study including assessment, evaluation, feasibility and economic studies will be required.
Prerequisite (s)	--
Textbook	As advised
Lab/Computer	--

PET478	Environmental Engineering and Safety 3 CH (2,2,0)
Course Contents	Energy use and energy patterns in modern society. Resource estimates. Engineering analysis of energy systems. Managing carbon emissions. Environmental impact and protection, Environmental remediation technologies. Introduction to the principles of safety and environment element for the upstream sector of petroleum industry. Fundamentals of safety measures, actions, performance and lost time incidents and awareness. Incident command system (ICS). Environmental Impact Assessment (EIA) waste disposal management system.
Prerequisite (s)	--
Textbook	1. M. L. Davis, D. A. Cornwell: “Introduction to Environmental Engineering”, 6th ed., McGraw-Hill Education, 2023 2. D. Ghosh, D: “Safety in Petroleum Industries” Taylor and Francis, 2021
Lab/Computer	--

PET498	Graduation Project 1 2 CH (1,0,3)
Course Contents	Senior capstone design project(s) based on industry data. Application of reservoir engineering: drilling and production engineering principles to evaluate and solve an industry problem such as a new field development, evaluation of an existing reservoir asset, or analysis of field re-development.
Prerequisite (s)	Approval
Textbook	All Petroleum Engineering References delivered previously by FUE
Lab/Computer	--

PET499	Graduation Project 2 3 CH (1,0,6)
Course Contents	An engineering assignment requires the student to demonstrate initiative and assume responsibility. Students can propose their own project. A project report is required at the end of the tenth semester.
Prerequisite (s)	PET498
Textbook	All Petroleum Engineering References delivered previously by FUE
Lab/Computer	--

10.G. Structural Engineering & Construction Management Course Descriptions

SCMxxx Courses

SCM211	Structural Analysis 1 3 CH (2,2,0)
Course Contents	Types of structures, structural Loads (point loads, uniform distributed loads, and linear distributed loads), Supports (roller, hinged, fixed), Stability of structures, Equilibrium equations, Analysis of 2D determinate straight beams. Analysis of 2D determinate Frames. Analysis of 2D determinate trusses (joint and section methods). Calculated reactions, Draw Internal forces (normal, shear and bending moment) diagrams.
Prerequisite (s)	EMP131
Textbook	"Structural Analysis", R.C. Hibbeler, Prentice Hall, Singapore,2005
Lab./Computer	--

SCM213	Structural Mechanics 1 3 CH (2,2,0)
Course Contents	Properties of plane areas (area, center of gravity, 2nd moment of inertia). Normal stresses in sections due to axial forces, bending moments and combination of them. Shear stresses in symmetrical and asymmetrical solid and hollow sections, Torsional shear stresses in circular and non-circular sections, Combined stresses (normal and shear stresses). Principal stresses (principal directions, Mohr circle diagram).
Prerequisite (s)	SCM211
Textbook	"Structural Analysis", R.C. Hibbeler, Prentice Hall, Singapore,2005
Lab./Computer	--

SCM218	Steel Structures for Architects 2 CH (1,2,0)
Course Contents	Equilibrium, stability & compatibility, External & internal equilibrium of statically determinate plane structures: beams, frames & trusses, Normal, shear, tensional stresses & combined stresses, Elastic deformations, Introduction to the analysis of statically indeterminate structures through consistent deformations & moment distribution, Buckling of columns, Introduction to space structures. Design principles of steel structures, Structural systems, Design loads, Design of members subjected to axial forces or shear, Design of bolted and welded connections, Structural details for trusses and frames, and Details of connections for exterior and interior use.
Prerequisite (s)	--
Textbook	*The Egyptian Code of Practice of Design and Constructions of Steel Structures.*
Lab./Computer	Emphasis on: “Steel Structures for Architects”

SCM219	Properties & Strength of Materials 2 CH (1,2,0)
Course Contents	Various building materials, their properties, testing and uses, Materials used in engineering products, Standards, Codes and inspections, The development of innovative uses of building materials, Concrete: components, manufacturing, quality control, Partitioning materials: gypsum, lime, timber and bricks, The effects of water on building materials.
Prerequisite (s)	None

Textbook	-The Egyptian Code of Practice of Design and Constructions of Concrete Structures (EC-203). - A.M. Neville and J.J. Brooks: *Concrete Technology*, Pearson Education. ISBN 10:8131705366 / ISBN 13: 9788131705360 - P.K. Mehta and Pauli J.M. Monteiro: *Concrete Microstructure, Properties and Materials.* McGraw Hill
Lab./Computer	Emphasis on: "Properties & Strength of Materials"

SCM221	**Strength and Technology of Materials 1** **3 CH (2,1,1)**
Course Contents	Engineering materials, Standardization, Standard specifications, Codes, Total quality concept, Technical inspection and quality control, Principles of materials science, concrete technology: constituent materials for reinforced concrete (aggregates, cement, mixing water, admixtures, steel reinforcement), Concrete manufacturing, Mechanics of engineering materials: loads, stresses, strains, elastic constants, failure criteria, Mechanical properties, Testing machines, Strain gages, Calibration, Strength and behavior of materials under static loading (tension, compression, bending, shear, torsion, hardness), Miscellaneous conventional and Non-conventional construction materials and products.
Prerequisite (s)	--
Textbook	"Materials for Civil and Construction Engineering", John P. Prentice Hall, 2005
Lab./Computer	Exp.1: Tensile strength of steel

SCM222	**Strength and Technology of Materials 2** **3 CH (2,2,1)**
Course Contents	Concrete technology: Concrete mix design, properties and laboratory tests of fresh and hardened concrete, dimensional changes (dry shrinkage) , concrete manufacturing under severe weathering conditions (hot and cold weathers), durability of concrete in aggressive environments (carbonation, chemical resisting, crack control), types and repair of cracks (dry shrinkage, flexural, shear, torsion, differential settlement), fire resistance, repairing materials (bonding epoxy, fibers, steel sections)
Prerequisite (s)	SCM221
Textbook	"Concrete Technology", A.M. Neville & J.J. Brooks
Lab./Computer	Exp.1:Test of aggregates properties Exp.2:Test of fresh concrete properties Exp.3:Test of hardened concrete Properties Exp.4:Test of concrete mix

SCM231	**Planimetric Surveying** **3 CH (2,1,1)**
Course Contents	Distance measurements and their corrections, Surveying operations using distance measurements, Area computations, Angle measurements using theodolites, Traverse, Coordinate computation and transformation of coordinates. Tachometry, Mapping, Engineering projects layout, Accuracy of surveying measurements, Probability theory. Leveling, Grid leveling, Contour maps, Profiles, Cross sections, Volume computations (cut and fill), using total station and digital levels.
Prerequisite (s)	--
Textbook	"Surveying" ,Stanley Raymond, Pearson, Prentice Hall, 1998
Lab./Computer	Exp.1: Distance measurement Exp.2: HL. angular measurements Exp.3: VL. angular measurements Exp.4: Leveling measurements

SCM281	Fundamentals of Construction Project Management 3 CH (2,2,0)
Course Contents	Introduction to structure engineering project management, Introduction to the construction environment, Construction project phases, Selecting the special services for managing and executing the construction project, Construction projects organization, Construction management approaches, Introduction to CPM method, Labor productivity, Material management, Equipment optimum use, Project control, Constructability, Safety in construction, Application with emphasizing on civil engineering projects.
Prerequisite (s)	--
Textbook	"Construction Management Fundamentals", Schexnayder, and Mayo, Mcgraw Hill, 2008
Lab./Computer	--

SCM282	Construction Project Management 4 CH (2,4,0)
Course Contents	Introduction to Construction Project Management, Project Initiation and Life Cycle, Project Delivery Methods, Project Organization Structure, Project Planning Fundamentals and Scheduling Techniques, Resource and Cost Management, Project Cash Flow, Project Control and Update, Project Crashing (time-cost trad-off) and Update, Project Closeout and Lessons Learned, Software Tools for Planning and Scheduling
Prerequisite (s)	--
Textbook	"Construction Management Fundamentals", Schexnayder, and Mayo, McGraw Hill, 2008
Lab./Computer	--

SCM291	Civil Engineering Drawing 3 CH (2,2,0)
Course Contents	Introduces the fundamentals of civil engineering drawings, project characteristics, legends, scales, and projections. Views, cross-sections, and detailed drawings for earthworks, canals, drains, roadways, reservoirs, and landscapes. Retaining walls and floors: shaping, projection, hatching, typical cross sections, Applications on drawing complete structures: half-earth-removed views, pitching and protection works. Drawing of steel structures: views, sections, details, reverts, welding, hatching, applications on drawing steel joints and members, Drawing of reinforced concrete structures. Advanced applications on drawing of civil engineering projects.
Prerequisite (s)	EMP141
Textbook	"Textbook of Engineering Drawing", Reddy, K. Venkata, 2010
Lab./Computer	--

SCM312	Structural Analysis 2 3 CH (2,2,0)
Course Contents	Analysis of determinate arches (3-hinges arches) and cable structures (under point loads and distributed loads). Introduction to space structures (space trusses). Analysis of structures under moving loads (single point load, and multi point loads and uniform loads), Drawing Influence lines (bending moment, shear force and normal force) for 2D statically determinate Beams, Frames, (normal force) for 2D determinate trusses.
Prerequisite (s)	SCM211
Textbook	"Structural Analysis", R.C. Hibbeler, Prentice Hall, Singapore,2005
Lab./Computer	--

SCM314	Structural Mechanics 2 3 CH (2,2,0)
Course Contents	Calculation of 2D structures deformations (due to normal force, shear force and bending moment). Differential equations, double integration method, conjugate beam method, virtual work method. Analysis of statically indeterminate 2D beams and frames. method of consistent deformations, three moment equation method, method of moment distribution (with & without sway). Slope deflection method. Analysis of statically indeterminate 2D trusses.
Prerequisite (s)	SCM213
Textbook	"Structural Analysis", R.C. Hibbeler, Prentice Hall, Singapore,2005
Lab./Computer	--

SCM355	Reinforced Concrete & Foundations for Architects 2 CH (1,2,0)
Course Contents	Design principles of concrete, Fundamentals of reinforced concrete structures, Analysis and design of sections subjected to bending, Loads and load distribution, Reinforcement details of beams, Solid slabs, Columns, Stairs, Statically determinate frames, Ribbed and hollow block slabs, Paneled Beam slabs, Flat slabs. Soil Characteristics and Mechanics, Stress in Soil and Soil Compressibility, Theory of Consolidation and Settlement, Shear Strength of Soil, Compaction of Soil, Lateral Earth Pressure and Retaining Walls, Site Investigation and Selection of Foundation, Bearing Capacity of Soil, Types of Foundation and Design Principles of Foundations.
Prerequisite (s)	--
Textbook	-The Egyptian Code of Practice of Design and Constructions of Concrete Structures (EC-203). -Das, B.M.; Principles of Foundation Engineering, CA 93950
Lab./Computer	Emphasis on: “Reinforced Concrete & Foundations for Architects”

SCM341	Environmental and Sanitary Engineering 3 CH (2,2,0)
Course Contents	Definitions and terminology, Fields of environmental and sanitary engineering, Biosphere and environmental cycles, Issues of environmental pollution (Air, water, soil), solid wastes recycling. Water supply engineering: Water demands, sources of water supply, collection works, purification works, distribution works, Sanitary drainage: sources of wastewaters, sewerage systems, hydraulic design, network accessories, sewage treatment systems.
Prerequisite (s)	MEC232
Textbook	"The Civil Engineering Handbook ", 2nd Edition, Wai-Fah Chen, CRC, 2002
Lab./Computer	--

SCM351	Fundamentals of Reinforced Concrete Design 3 CH (2,2,0)
Course Contents	Design using limit states method (ultimate limit & serviceability limit). Load distribution on beams (one way and two ways slabs). Design of sections subjected to Axial compression (axial load short column), axial tension (ties and truss members), bending moments (beams and slabs), shear, and torsion and combined axial with bending moments (frames). Deflection calculations. ECP provisions for beams and columns design. Reinforcement details, develop length, rebars curtailment, and rebars splices.
Prerequisite (s)	SCM213
Textbook	"Design of reinforced concrete structures Vol. 1", Dr. Mashhour Ghoniem, 2008
Lab./Computer	--

SCM352	Reinforced Concrete Slabs 3 CH (2,2,0)
Course Contents	Design and reinforcement details: solid slabs (one way, two ways and inclined slabs), ribbed slabs (one way, two ways), paneled beams slab, flat slabs (empirical method, equivalent frame method, check punching), Stairs (one flight, two flights, three flights, cantilever stair, helical stair, freestanding stair). Serviceability limits, cracked section, effective inertia, creep, long term and total deflection, ECP provisions. Reinforcement detailing of different slab types
Prerequisite (s)	SCM351
Textbook	"Design of reinforced concrete structures Vol. 2", Dr. Mashhour Ghoniem, 2008
Lab./Computer	--

SCM361	Fundamentals of Metallic Structures Design 3 CH (2,2,0)
Course Contents	Design using allowable stress design method. Section classifications (compacted, non-compacted, slender). Design of members (rolled and built-up) subjected to tension (bolted & welded), compression (symmetrical & non-symmetrical), shear, bending moment, and combined axial with bending moments (single & double). , Design of beams (Lateral torsion buckling). Design of connections subjected to axial, shear and bending moment (bolted & welded).
Prerequisite (s)	SCM213
Textbook	" Steel Structure Design " Allowable Stress Design ", Abdel-Reheem Khalil Dessouki, 2009
Lab./Computer	--

SCM372	Soil Mechanics 3 CH (2,1,1)
Course Contents	Soil compaction (Proctor test, sand cone test), Permeability (constant and falling head tests), Seepage (flow net), Effective stress, Stresses distribution in soil (Boussinesq & Newmark methods), Compressibility of soil (for sand and clay) , Theory of consolidation (odometer test, long term settlement, secondary consolidation), shear strength of soil (direct shear test, tri-axial test, van shear test), Slope stability (friction circle method, slices method and Taylor method).
Prerequisite (s)	EMP371
Textbook	"Soil Mechanics and Foundation Engineering", K.R. Arora , 2004
Lab./Computer	Exp.1: Test of soil compaction Exp.2: Test of permeability Exp.3: Test of consolidation

SCM382	Engineering Economics and Finance 3 CH (2,2,0)
Course Contents	Overview of engineering economic analysis; Introduction and the time value of money; Cash flow diagram rules; Interest; Common cash flow series; Uniform cash flow series, Simple interest, Compounded interest, Compound interest notation and interest tables Interest, compounded other than yearly. Single period cash flow, Linear gradient cash flow series Irregular cash flow series Concept of economic equivalence; Net present value NPV in Excel, Annual equivalent worth, Capital budgeting selection of multiple projects, Breakeven analysis; Depreciation; Expected value Sensitivity analysis.
Prerequisite (s)	--
Textbook	"Engineering Economy" latest ed. Blank, and Tarquin, McGraw Hill, 2012
Lab./Computer	--

SCM383	Construction Engineering Contracts 3 CH (2,2,0)
Course Contents	Introduction to Law and Contracts, Contract Principles and Construction Project, Contract Formation, Breach of Contract, Damages for Breach of Contract, Contractual Relationships on the construction Project, Contract Types, Awarding Process, Cost-basis, The Contract Documents, The Agreement, General Conditions, Defining the Scope of Work, Interpreting the Contract, Contractor's Performance Obligation, Competitive Bidding, Concept of competitive bidding, Bid Evaluation, Bid Security, Mistakes in Bids, Architects, Engineers (A/E) and the Construction Process, Owner's Assurance of Performance, FIDIC, Changes in the Work, Subcontractors and Suppliers, Delays and Claims, Disputes Resolution, Mediation
Prerequisite (s)	SCM282
Textbook	"Construction planning, equipment and Methods", Robert Peurifoy, McGraw-Hill, 2011
Lab./Computer	--

SCM433	Transport Planning and Traffic Engineering 3 CH (2,2,0)
Course Contents	Transport planning: introduction to transport sciences, Definitions, Time horizons of transport planning, Elements of urban transport planning procedures, Data base, Introduction to travel demand forecasting models, Introduction to traffic management and public transport improvements, Introduction to evaluation of strategic transport plans and traffic management schemes, Traffic engineering: vehicle, user and road characteristics, Studies of traffic stream characteristics (speed, volume, trip time & delay), Fundamentals of traffic flow: speed, volume and density relationships,, Highway capacities, Traffic control devices
Prerequisite (s)	--
Textbook	"Traffic Engineering", McShane W., Prentice Hall
Lab./Computer	--

SCM434	Highway and Airport Engineering 3 CH (2,2,0)
Course Contents	Introduction to highway and airport planning, Classification of highways, Design controls and criteria, Design of elements in the longitudinal direction, Design of cross sections, Design of At-Grade intersections, Grade separations and interchanges, Types of pavements, Calculation of stresses in flexible and rigid pavements, Types and characteristics of paving materials and mixtures, Equivalent axel loads, Design of flexible and rigid pavement, Introduction to pavement Repair..
Prerequisite (s)	SCM433
Textbook	"The Handbook of Highway Engineering", T.F. Fwa, Taylor & Francis, 2006
Lab./Computer	--

SCM473	Foundations 3 CH (2,2,0)
Course Contents	Bearing capacity of soil (concentric load, eccentric load, inclined load, Lateral earth pressure (Rankine & Coulomb methods). Design of retaining walls (gravity, cantilever walls). Design of shallow foundations (isolated, strip, combined, strap, raft. Types of deep foundations (Piles, Piers and Caissons), Pile capacity (vertical compression & tension), Laterally loaded piles (rigid & fixable). Design of pile caps (Isolated & combined).
Prerequisite (s)	SCM372
Textbook	"Soil Mechanics and Foundation Engineering", K.R. Arora , 2004
Lab./Computer	--

SCM484	Introduction to BIM 3 CH (2,1,1)
Course Contents	Introduction BIM: BIM promise and development; BIM: new tools and new processes; what are the benefits of BIM? What Problems does it address? Future of designing and building with BIM and case studies; core technologies and software; Collaboration and Interoperability; BIM for Owners, Facility Managers, Engineer, Contractors BIM for Subcontractors and Fabricators. The Future: Building with BIM. BIM Case Studies
Prerequisite (s)	SCM282
Textbook	"BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers." 2018 by John Wiley & Sons, Inc.; LCC TH437 (eBook); https://lccn.loc.gov/2018001037.
Lab./Computer	--

SCM485	Health, Safety, and Risk Management in Construction 3 CH (2,2,0)
Course Contents	Introduction to Construction Safety, Hazard Identification, and introduction to risk management; Risk Management planning; Risk identification methods and approaches; Qualitative risk assessment concept, method and Approaches; Quantitative risk assessment concept, method and Approaches; Risk response plans to negative and positive risks; Risk control and registering; Protective Equipment (PPE), Working at Heights and Excavation and Trenching Safety, Tools and Machinery Safety, Health, and Hygiene on Site
Prerequisite (s)	SCM282
Textbook	"Construction Introduction to Health and Safety in Construction", Phil Hughes and Ed Ferrett, fifth edition published 2016, Routledge- Taylor & Francis Group; ISBN: 978-0-415-82436-1 (pbk)
Lab./Computer	--

SCM486	Quantity Surveying and Cost Estimation 3 CH (2,2,0)
Course Contents	Introduction to quantity surveying and cost estimate, Approximate estimates, Detailed estimates: quantity survey, labor cost, equipment cost, subcontractor cost, purchasing orders, indirect costs, Job overheads, Office overheads, Bonding, Insurance, Taxes, Bid calculation, Mark-up concepts, Contingency estimate, Profit estimates, Unit cost estimate, Lump-sum cost estimate, Cost plus (negotiated cost estimate), Payments in Construction projects, advance payments, interim payments, final payment, retention amounts, liability periods, Cash flow estimate and cost loadings.
Prerequisite (s)	--
Textbook	"Construction Management Jump Start" 2nd edition, Jacson, Barbara J., 2010
Lab./Computer	--

SCM491	Graduation Project-1 2 CH (1,3,0)
Course Contents	An engineering assignment requiring the student to demonstrate initiative and assume responsibility, The student will select a project at the end of the seventh semester, Students can propose their own project, A faculty member will provide supervision, and A project report is required at the end of the eighth semester. The project should be in one of the following topics: design of concrete structures, design of steel structures, Geotechnical engineering, repair & strengthening, construction management and special structures.
Prerequisite (s)	As Advised
Textbook	--
Lab./Computer	--

SCM492	Graduation Project-2 3 CH (2,2,0)
Course Contents	Continuation to the bachelor project started in SCM491
Prerequisite (s)	SCM 491
Textbook	--
Lab./Computer	--

SCM315	Structural Mechanics 3 (Elective) 3 CH (2,2,0)
Course Contents	The course provides an in-depth study of matrix analysis techniques for structural systems. It covers the fundamental concepts of flexibility and stiffness methods and their formulation. Emphasis is placed on applying the stiffness method to analyze 2D-beams, 2D-frames, 2D-trusses, and 3D-trusses using systematic procedures. The course also introduces the basic principles of the finite element method for more advanced structural analysis and computational modeling in structural engineering applications.
Prerequisite (s)	SCM213
Textbook	"Structural Analysis", R.C. Hibbeler, Prentice Hall, Singapore,2005
Lab./Computer	--

SCM316	Structural Mechanics 4 (Elective) 3 CH (2,2,0)
Course Contents	The course is concerned in key structural analysis and stability topics. It covers elastic buckling behavior in columns and beam-columns under axial and lateral loads. It introduces the plastic analysis techniques for beams and rigid frames, emphasizing load redistribution beyond yield. Approximate analysis methods for indeterminate planar structures are also included. The course concludes with membrane stress analysis in shells of revolution and cylindrical shells, highlighting their structural behavior under various loading and support conditions.
Prerequisite (s)	SCM213
Textbook	"Structural Analysis", R.C. Hibbeler, Prentice Hall, Singapore,2005
Lab./Computer	--

SCM317	Structural Dynamics & Earthquake Engineering (Elective) 3 CH (2,2,0)
Course Contents	Un-damped and damped free vibration analysis of SDOF systems, Response of SDOF system to harmonic loading, Free vibration analysis of MDOF systems, The nature of earthquake ground motion, Seismicity of the world and of Egypt, Causes of earthquakes, basic glossary and terminology, Seismic waves, Quantification of earthquakes, Damage mechanism, Characteristics of earthquake ground motions, Philosophy of design, Response spectrum analysis
Prerequisite (s)	SCM213
Textbook	"Structural Dynamics, Theory and Computations", MarioPaz , 2008
Lab./Computer	--

SCM418	Computer Applications for Structural Design (Elective) 3 CH (2,2,0)
Course Contents	Application of Excel & Other Tools for Design of Various Structural Elements like, Slabs, Beams, Columns & Foundations etc. Structural Response. Modelling of Various Types of Structures in Commercially available Software. Structural Analysis of Trusses, Rigid Frames and Braced Frames. Modelling & Analysis of Industrial Shed Structures. Interpretation & Understanding Post-Processing Results from Software.
Prerequisite (s)	SCM352

Textbook	"An Introduction to EXCEL for Civil Engineers", Gunthar Pangaribuan, 2016
Lab./Computer	--

SCM323	**Advanced Technology of Construction Materials (Elective) 3 CH (2,2,0)**
Course Contents	The course presents an introduction to advanced construction materials, focusing on their fabrication methods and practical applications. Students will explore the properties of fibers and polymers, including their stiffness, strength, and behavior under various loading conditions. Emphasis is placed on understanding failure criteria for advanced materials and their role in enhancing structural performance. The course also covers techniques for strengthening reinforced concrete (RC) elements using these materials, providing the essential knowledge for modern structural rehabilitation and design.
Prerequisite (s)	SCM222
Textbook	"Mechanics of Advanced Composite Materials", Gibson
Lab./Computer	--

SCM324	**Inspection and Repair of Structures (Elective) 3 CH (2,2,0)**
Course Contents	This course provides a comprehensive overview of structural damage, focusing on the types and causes of cracks in various building elements. It covers techniques for inspecting and assessing existing structures to evaluate their condition and identify necessary interventions. Exploring the philosophy behind repair and strengthening strategies, including the selection and application of appropriate repair materials. The course also examines various strengthening and repair techniques, emphasizing both traditional and modern methods to enhance the performance and durability of structures.
Prerequisite (s)	SCM231
Textbook	"Repair And Rehabilitation Of Concrete Structures", Poonam I. Modi, PHI Learning Pvt Ltd (2016)
Lab./Computer	--

SCM232	**GIS and Photogrammetry (Elective) 3 CH (2,2,0)**
Course Contents	Earth surface, Geodetic coordinate Systems, Geodetic networks, Fundamentals of satellite geodesy, Global positioning system GPS, Map projections Basics, Fundamentals and structure of Geographic information systems GIS. Photogrammetry: Aerial cameras, Vertical photograph, Tilted photograph, Rectification, Photo coordinates refinement, Flight planning, vertical & horizontal curves, setting out of projects.
Prerequisite (s)	SCM231
Textbook	"Geoinformation : Remote Sensing, Photogrammetry & Geographic Information Systems", G. Koneeny, Publisher: CRC, 2014
Lab./Computer	--

SCM342	**Hydraulics (Elective) 3 CH (2,2,0)**
Course Contents	Open channel flow: types of flow, conservation laws of mass and energy, specific energy concept, flow resistance in channels, sketching and calculations of water surface profile for gradually varied flow, design of cross sections in open channels, momentum equation and specific force concept, design of stilling basins downstream of gates and pipe outlets, physical models, Introduction to river engineering and sediment transport, Pumps: types and characteristics of pumps, pumps and pipeline systems, Hydraulics of groundwater: types of aquifers, groundwater flow.
Prerequisite (s)	MEC232

Textbook	"Fundamentals of Hydraulic Engineering Systems", Water Hwang, Prentice Hall, 2008
Lab./Computer	--

SCM343	**Irrigation and Drainage Engineering (Elective) 3 CH (2,2,0)**
Course Contents	Definitions of irrigation and drainage, Different sources of water for irrigation and its quality, Soil water plant relationship, Estimation of crop consumptive use, Introduction to the design of different irrigation systems: surface irrigation, sprinkler irrigation, drip irrigation, Introduction to the design of agricultural drainage system: tile drainage, surface drainage, and vertical drainage.
Prerequisite (s)	MEC232
Textbook	"Irrigation and Drainage Engineering", ElSaieMoh. Yasser, FattohEhab, 2004
Lab./Computer	--

SCM453	**Reinforced Concrete Tanks (Elective) 3 CH (2,2,0)**
Course Contents	This course covers the design and analysis of reinforced concrete water structures with emphasis on serviceability and strength requirements. Topics include cracking limits in concrete members, structural behavior and design of water tanks (rectangular and cylindrical types), including elevated, ground-supported, and underground configurations. The course also explores the unique characteristics of deep beams and their reinforcement detailing. Additionally, it addresses the structural design considerations for swimming pools, focusing on load conditions, water tightness, and durability against environmental effects.
Prerequisite (s)	SCM352
Textbook	" Design of reinforced concrete structures" Vol. 3", Dr. Mashhour Ghoniem, 2008
Lab./Computer	--

SCM454	**High-Rise & Pre-Stressed Concrete Structures (Elective) 3 CH (2,2,0)**
Course Contents	The course covers the analysis and design of high-rise structures subjected to lateral loads (wind and seismic forces). It includes calculating the loads, evaluating the resulting internal forces, and exploring structural systems that resist lateral loads. The course also includes the design and detailing of shear walls, structural cores, and moment-resisting frames. It also introduces pre-stressed concrete concepts and emphasizes the design and detailing of determinate structures to ensure stability, safety, and structural performance.
Prerequisite (s)	SCM352
Textbook	" Design of reinforced concrete structures" Vol. 3", Dr. Mashhour Ghoniem, 2008
Lab./Computer	--

SCM462	**Cold Formed & Composite Structures (Elective) 3 CH (2,2,0)**
Course Contents	The course focuses on the analysis and design of high-rise steel buildings. It covers essential structural systems and evaluates various design loads including dead, live, wind, and seismic forces. It also includes the static analysis techniques and common floor system configurations. Special emphasis is placed on cold-formed steel members and their applications. The course also introduces the design of composite structures, particularly composite beams and columns, integrating steel and concrete to optimize structural performance in tall building construction.
Prerequisite (s)	SCM361
Textbook	" Steel Structure Design " Allowable Stress Design ", Abdel-Reheem Khalil Dessouki, 2009
Lab./Computer	--

SCM463	Metallic Bridges (Elective) 3 CH (2,2,0)
Course Contents	The course covers the structural systems used in bridge engineering, including various floor types and their applications. It addresses essential design loads that impact bridge performance and safety. Detailed study is given to the design of plate girders, focusing on buckling considerations, fatigue effects, optimal cross-section design, and construction detailing. Additionally, the course explores the design principles of composite beams and the structural design of bridges featuring multiple main girders, providing a comprehensive understanding of modern bridge design challenges and solutions.
Prerequisite (s)	SCM361
Textbook	" Steel Structure Design " Allowable Stress Design ", Abdel-Reheem Khalil Dessouki, 2009
Lab./Computer	--

SCM387	Resource Management (Elective) 3 CH (2,2,0)
Course Contents	Meaning of management; What are the project resources; Meaning of project management. Stages of engineering projects; Aspects of resource management. Material scheduling, production, and procurement, Handing. Reduction of material waste, utilization, and material costing. Labor planning and organization, scheduling, productivity, utilization, and costing of labor usage. Equipment planning and selection, production rate, utilization, matching and costing.
Prerequisite (s)	SCM281
Textbook	"Construction Management Jump Start" 2nd edition, Jacson, Barbara J., 2010
Lab./Computer	--

SCM288	Construction Technology (Elective) 3 CH (2,2,0)
Course Contents	Introduction to construction methods, Earth work equipment for excavation, backfilling in building construction, excavation for infrastructure and heavy construction projects. Foundation technology for deep foundation and shallow systems, Temporary structures either wood formwork or metal formworks. Principles of wood formwork design. Precast concrete fabrication, production, and installations. Prestressed concrete, Steel structure fabrication and erection, Scaffolding, Safety equipment, tools, and precautions within siteworks for people and equipment.
Prerequisite (s)	--
Textbook	"Construction Methods and Management", Stephens W. Nunnally
Lab./Computer	--

SCM391	Value Engineering in Construction Projects (Elective) 3 CH (2,2,0)
Course Contents	Introduction and Summary, Opportunities for VE Application, Introduction to the VE Methodology, The VE Methodology in Detail, Information Phase, Function Analysis Phase, Creative Phase, Evaluation Phase, evaluation techniques to identify the relative of importance for evaluation criteria or factors. Evaluation techniques for determining best alternatives for the required function(s). Development Phase and Presentation Phase Implementation Phase, Case Studies
Prerequisite (s)	SCM281
Textbook	"Construction Management Jump Start" 2nd edition, Jacson, Barbara J., 2010
Lab./Computer	--

SCM392	Computer applications for construction management (Elective) 3 CH (2,2,0)
Course Contents	Introduction to the latest technologies and applications of Artificial Intelligence (AI) in the domain of construction engineering and management. The construction industry and its adoption to digital technology. Data combination with fast, iterative processing, and intelligent algorithms (e.g., neural networks, process mining, and deep learning) based on automatic computer learning using patterns or features in the data. Solutions addressing the challenges of construction problems, such as knowledge discovery, risk estimates, root cause analysis, damage assessment and prediction, and defect detection. Emerging applications of AI in construction.
Prerequisite (s)	SCM281
Textbook	Limao Zhang · Yue Pan · Xianguo Wu · Mirosław J. Skibniewski (2021) "Artificial Intelligence in Construction Engineering and Management" SBN 978-981-16-2842-9 (eBook) https://doi.org/10.1007/978-981-16-2842-9
Lab./Computer	--

SCM393	AI in construction engineering (Elective) 3 CH (2,2,0)
Course Contents	Introduction to the latest technologies and applications of Artificial Intelligence (AI) in the domain of construction engineering and management. The construction industry and its adoption to digital technology. Data combination with fast, iterative processing, and intelligent algorithms (e.g., neural networks, process mining, and deep learning) based on automatic computer learning using patterns or features in the data. Solutions addressing the challenges of construction problems, such as knowledge discovery, risk estimates, root cause analysis, damage assessment and prediction, and defect detection. Emerging applications of AI in construction.
Prerequisite (s)	SCM281
Textbook	Limao Zhang · Yue Pan · Xianguo Wu · Mirosław J. Skibniewski (2021) "Artificial Intelligence in Construction Engineering and Management" SBN 978-981-16-2842-9 (eBook) https://doi.org/10.1007/978-981-16-2842-9
Lab./Computer	--

SCM394	Assets management (Elective) 3 CH (2,2,0)
Course Contents	Asset management & strategic planning overview; the asset manager's role; a day in the life of an investment; ownership structures & identifying investment partner; the decision to acquire assets; retaining property management & leasing services; pro forma preparation, monitoring performance & reporting; strategic planning & the decision to invest in capital improvements; The Decision to dispose of an asset.
Prerequisite (s)	SCM281
Textbook	Telli Van der Lei, Paulien Herder, and Ype Wijnia (2012) "Asset Management" eBook ISBN978-94-007-2724-3
Lab./Computer	--

SCM395	Facilities management (Elective) 3 CH (2,2,0)
Course Contents	An introduction to facility management, benchmarking, strategic planning, business transformation and facility management, financial management for facility managers, ultimate customer service, alternative-workplace, facilities condition assessment, smart buildings, intelligent buildings, real estate portfolio management, space and asset management, operations and maintenance, overview and current state of FM technology, FM service monitoring and control. Invitations to Tender.
Prerequisite (s)	SCM281

Textbook	The facility management handbook / Kathy O. Roper, Richard P. Payant. — Fourth edition. ISBN-13: 978-0-8144-3215-0 © 2014 Kathy O. Roper and Richard P. Payant., AMACOM www.amacombooks.org/go/specialsales O.
Lab./Computer	**--**

10.H. General Faculty & University Course Descriptions

GENxxx Courses

GEN211	Practical Training 1	0 CH (0,0,0)
GEN311	Practical Training 2	0 CH (0,0,0)
Course Contents	Practical training is a part of the curriculum of all the major programs of the Faculty. The overall duration of the training is 150 hours, divided over two modules (75 training hours each) and should be carried at one or more engineering facilities (inside or outside Egypt). The training program shall be related to the student's major program and must be approved by the scientific department. The student is eligible to register the first and second training module after completing a minimum of 54 CH and 90 CH respectively. After completing each module, the student shall submit a report and deliver a presentation to be evaluated by the scientific department. The two training modules are equivalent to 1 CH.	
Prerequisite (s)	Completion of Level 2 (54 CH minimum)	
Textbook	None	
Lab./Computer	N/A	

ARC331	Engineering Ethics and Legislations	2 CH (2,0,0)
Course Contents	Laws and legislations concerning engineering works. It concerns Engineers Syndicate, Contractors, Industrial safety and, security fire conditions. Lifts conditions, environmental protection against pollution, insurance against fire, accidents, and other hazards; Law of investment; relation between owner and tenant. Job laws, Industry union laws, and Engineering Ethics.	
Prerequisite (s)	None	
Textbook	C. Harris, M. Pritchard, M. Rabins, “Engineering Ethics: Concepts and Cases”; Wadsworth.	
Lab./Computer	N/A	

SCM381	Engineering Project Management	2 CH (2,0,0)
Course Contents	Introduction to project management, Definitions used in project management, The project life cycle, project stages, , Time management, Gantt chart, Activity on arrow, Activity on node, Relationship between activities, Probabilistic Time Estimate, Time Crashing, Resources management, Quality control management.	
Prerequisite (s)	None	
Textbook	- Nehal Patel, Practical Project Management for Engineers, Artech House; Illustrated edition (May 31, 2019). - Gupta, R.M., 2014. Project Management. PHI Learning Pvt. Ltd	
Lab./Computer	N/A	

MEC391	Environmental Impact of Engineering Projects	2 CH (2,0,0)
Course Contents	Definition of the Environment and the different influencing factors. Human Influences of projects: Upgrading, development, economic, social, cultural, aesthetic, hygienic and psychological factors, Types of projects: Urban planning projects, Infrastructure projects Different Industrial projects. Environmental impact of projects: Negative and positive impacts (direct and indirect). The assessment of projects both nationally and internationally to avoid the negative consequences of projects on the environment. The approved rates and criteria for the compatibility of projects with environmental topics.	
Prerequisite (s)	None	
Textbook	- Larry W. Canter, "Environmental Impact Assessment", McGraw Hill , 1996.	
Lab./Computer	N/A	

University Requirements Courses

PSC 110	Human Rights	2 CH (2,0,0)
Course Contents	This course offers philosophical, legal, and political perspectives on human rights. After a short historical introduction to international human rights, it surveys international human rights treaties, courts, and institutions. Next it turns to topics in human rights theory, covering some contemporary philosophical theories of human rights. The final section explores some human rights problems and controversies such as economic and social rights, group rights, and cultural relativism.	
Prerequisite (s)	None	
Textbook	Rhona K. M. Smith.; “International Human Rights”; Oxford.	

CPS 101	Communication and Presentation skills	2 CH (2,0,0)
Course Contents	This course provides students with essential communication and presentation competencies required in scientific, engineering, and professional contexts. Emphasis is placed on the preparation, organization, and delivery of technical reports and professional documents, incorporating precise technical language and visual communication standards. Students will develop skills in audience analysis, collaborative communication, literature research, and ethical documentation practices. The course covers a variety of communication formats, including memos, proposals, progress reports, journal articles, oral presentations, instructions, and resumes.	
Prerequisite (s)	None	
Textbook	MIT Guide for science and engineering communication, second edition, Zimmerman and Paradise, MIT press.	

CSC 101	Introduction to Computers	2 CH (2,0,0)
Course Contents	This course aims to introduce beginners to Artificial Intelligent (AI) and Machine Learning (ML) basics with specific focus on their practical applications. The course aims to provide	

	students with a comprehensive overview of AI landscape. With introducing the fundamentals of deep learning, and the role of generative AI and Large Language Model (LLM) in modern computing. This will help students to apply generative AI to real business.
Prerequisite (s)	None
Textbook	1. Cay S. Horstmann; "C++ for Everyone"; Wiley. 2. Williams; "Using Information Technology"; McGraw hill.

ENG KET	**English KET**	**2 CH (2,0,0)**
Course Contents	ENG A2: A second tier English language course that focuses on all four skills (Reading, Writing, Listening, and Speaking) through the development of language production and reception. The course further builds upon the foundation of the previous course to reinforce language learning. Vocabulary is drawn from the reading and listening and strengthened with the use of grammar, writing, and speaking. More emphasis is given to fluency to achieve better communication.	
Prerequisite (s)	ENG ELE or placement into ENG KET	
Textbook	English Unlimited A2 – By Alex Tilbury, Theresa Clementson, Leslie Anne Hendra and David Rea – Cambridge University Press, 2012.	

ENG PET	**English PET**	**2 CH (2,0,0)**
Course Contents	**ENG B1:** A third tier English language course that is based on the lexical approach to language learning. This focuses on communication by improving fluency and accuracy through the development of interaction, through speaking and writing. Vocabulary from different topics (e.g. Work and studies), Talking about food and functions (have an interview, plan a meal) provide the reference by which language is introduced and enforced within clear everyday contexts. Writing is developed by looking at a range of texts, by understanding the rules of writing, and by developing confidence through planning and discussions.	
Prerequisite (s)	ENG KET	
Textbook	English Unlimited B1 – By Alex Tilbury, Theresa Clementson, Leslie Anne Hendra and David Rea – Cambridge University Press, 2012.	

ENV 101	**Environmental Science**	**2 CH (2,0,0)**
Course Contents	Introduction to environmental science, Survey of environmental issues related to health and disease, Natural resources management, nuclear waste disposal, water resources, Hydrology, energy use and conservation, Land reclamation, Global climate change, and industrial pollution, Environmental legislations.	
Prerequisite (s)	None	
Textbook		

PSY 101	Psychology	2 CH (2,0,0)
Course Contents	Definition of psychology, Physiological bases of behavior, Sensation, attention, and perception, Memory, Learning, and training, Manual control, Process control and automation, Psycho physiological correlation with behavior, Biofeedback, Experimental psychology.	
Prerequisite (s)	None	
Textbook	Robert S. Feldman.; "Understanding Psychology"; McGraw Hill.	

SCT 101	Scientific Thinking	2 CH (2,0,0)
Course Contents	Scientific thinking is the process of thinking logically, critically and creatively about real, as opposed to imaginary, problems. Students will develop an understanding of the scientific thinking process from a psychological perspective and will develop skill in scientific thinking. Topics will include the psychology of thought, logical operations and fallacies, convergent and divergent thinking, the relationship between language and thought, valid and invalid arguments, logic and probability, decision making and hypothesis testing in the science of psychology.	
Prerequisite (s)	None	
Textbook	Kenneth Hoover.; "The Elements of Social Scientific Thinking"; Cengage.	

SOC 101	Sociology	2 CH (2,0,0)
Course Contents	A scientific approach to the analysis of culture, socialization, social organization, the development of society, study of social processes, human groups, social institutions, and the effects of group relations on human behavior.	
Prerequisite (s)	None	
Textbook	Richard T. Schaefer.; "Sociology"; McGraw Hill.	