جامعة الحدود الشمالية
NORTHERN BORDER UNIVERSITY
كلية الهندسة

رؤية VISION 2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

دليل برنامج الهندسة الكهربائية (بكالوريوس)

كلية الهندسة - قسم الهندسة الكهربائية

Handbook of Electrical Engineering Program (Bachelor)

College of Engineering - Electrical Engineering Department

Academic Year 2023 - 2024
العام الجامعي 1445 - 1444 هـ

من الشمال...إلى الوطن

Declaration

تصريح

من الشمال...إلى الوطن

The Handbook of Electrical Engineering Program (Bachelor) is

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المقدمة

Introduction

من الشمال...إلى الوطن

The objective of the handbook is to provide students wishing to enroll in Electrical Engineering Program-Bachelor (EEP-Bachelor) with a preliminary overview on the program. Next version of the handbook will be developed towards a complete advising handbook where all relevant information from admission to the college of engineering until being graduated. At present, student admission, transfer and other policies are developed in separate documents available with the advisor and at the department administration.

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Program Overview

1. Introduction

The EEP was initiated since the first establishment of Northern Border University (NBU) in 2007. The NBU is located in Arar, the main city of Northern Border Province of the Kingdom of Saudi Arabia. The Electrical Engineering Department has well equipped laboratories and computer facilities as well as highly qualified faculty to achieve its educational aims and objectives. The teaching staff consists of Professor, Associate Professors, Assistant Professors and Laboratory Technician. The first group enrolled in this Program, was graduated in spring 2013. Graduates received the Bachelor of Science degree in Electrical Engineering (BSEE). The Program provides traditional lecture/laboratory sessions in only one location at the main campus in the College of Engineering buildings. All classes are provided during the day.

2. Mission

The Mission statement of the Electrical Engineering Program is:

To prepare electrical engineering graduates that compete in the labor market, sustain self-learning and professional development, and contribute to scientific research and community service.

3. Program Objectives

The Electrical Engineering Program at NBU expects the graduates within a few years after graduation to achieve the following objectives:

- PO1. Serve competently in the professional career and academia by demonstrating high-quality knowledge and skills in the Electrical Engineering field.
- PO2. Display self-learning, research, and critical thinking capability and take initiative in advancing their education and professional standing.
- PO3. Function as a team member with the capability for leadership and effective communication.

- PO4. Exhibit commitment to social responsibilities, ethical values, and meaningful community contributions.

4. Program Learning Outcomes (PLOs)

The Electrical Engineering program student outcomes ensure that students have the knowledge, skills, and competences at the time of degree completion that will enable them to realize the educational objectives in their professional lives. Their statements are presented in Table 1.

Table 1. Program Learning Outcomes

PLOs	Description
K1	Demonstrate a coherent and broad body of knowledge in basic sciences, mathematics, and concepts in the electrical engineering discipline.
S1	Identify, formulate, and solve complex engineering problems by applying engineering, science, and mathematics principles.
S2	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.
S3	Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to conclude.
S4	Communicate effectively with a range of audiences.
V1	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.
V2	Function effectively on a team whose members provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
V3	Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic And Career Advising

1. Introduction

The Electrical Engineering Program is committed to providing a holistic advising and career guidance program integral to helping students make well-informed decisions about their academic path and future careers. This support system is initiated from the moment students join the college and is sustained throughout their academic journey.

2. Academic Advising

For every student, a faculty member approved by the EE Department Council is assigned as an Academic Advisor to provide curricular guidance and ensure that the student meets all the requirements of the University, College, and EEP and graduate on time .

The Academic Advisor continuously monitors the student's academic performance and progress and provides adequate counseling on all academic matters including :

- course selection
- adding/dropping courses
- course conflicts
- credit transfer
- withdrawals

2.1. Contacting Advisor

As students in the College of Engineering, if there are any questions about academic programs, career prospects, or any other concerns, advisors can be reached for assistance. Advisors are available during scheduled office hours or by appointment, and they can also be contacted through email or phone.

Following are some methods to establish contact with the advisors:

- Office hours: Advisor's office hours are posted on their office doors or in the course syllabus.

- By appointment: If students can't meet with advisors during the office hours, they can schedule an appointment by emailing the advisor or calling their office number.
- By email or phone: For quick queries, students can email or call their advisor. The advisor's email address and phone number are listed on the college website.

The College of Engineering demonstrates an unwavering commitment to students' academic and professional growth through its robust academic advising and career guidance programs. With a focus on personalized support, the dedicated team of advisors works diligently to assist students in navigating their academic journey and making informed decisions about their future careers.

2.2. Definitions

2.2.1. Academic Term

A period of no less than fifteen weeks in a two-term system, or no less than twelve weeks in a three-term system, not including the registration and final examination periods.

Academic Term is a period that typically lasts for 15 weeks in a two-term system, or 12 weeks in a three-term system. It is the basic unit of time for academic planning and scheduling.

2.2.2. Summer Term

A period of no less than eight weeks in a two-term system, or no less than six weeks in a three-term system. The weekly duration of each course in a summer term is twice its duration during the regular academic term.

Summer Term is a shorter academic term that is typically offered during the summer months. It is a good option for students who want to accelerate their studies or make up for missed coursework.

2.2.3. Study Plan

A collection of obligatory, elective, and free courses, the total credit units of which constitute the graduation requirements that the student must successfully complete to obtain the academic degree in the specified specialization.

A Study Plan is a document that outlines the courses that a student must complete in order to graduate from a university. It typically includes a list of required courses, as well as elective and free courses that the student can select.

2.2.4. Course

An academic subject included in the Study Plan of each program. It is identified by a number, code, title, and detailed description of its content. Each course is subject to follow-up, evaluation, update and development within each department. It may be taught independently or have prerequisite or co-requisite requirements.

A course refers to a unit of academic instruction that typically requires a certain number of contact hours per week. Courses can be taught in a variety of formats, including face-to-face, online, or blended.

2.2.5. Credit Hour

Each of the weekly lectures, with a duration not less than fifty(50) minutes or a laboratory session or field study of not less than 100 minutes' duration. Credit Hour is a unit of measurement that is used to track the amount of time that a student spends in class. One academic unit typically corresponds to 50 minutes of lecture time, or 100 minutes of laboratory time.

2.2.6. Academic Probation

A notification given to a student with a cumulative GPA below the minimum acceptable limit as explained in this handbook.

Academic Probation is a formal notification issued to a student when his cumulative Grade Point Average (GPA) falls below the minimum acceptable limit set by the university, as outlined in this handbook. The purpose of an Academic Probation is to alert the student that his academic performance is not meeting the satisfactory standards set by the university. It serves as a means of intervention to help the student recognize the need for improvement and take appropriate action to enhance his academic standing. Receiving an Academic Probation does not typically result in immediate consequences, such as academic dismissal from the university. This is generally true for the first and second probationary periods. However, it is important to note that if a student is placed on probation for a third time, it may lead to more severe consequences, including academic dismissal from the university.

2.2.7. Teaching Methods

Various approaches used for instruction, including face-to-face instruction, blended learning, distance learning, self-learning, and other teaching methods.

These are the different ways that courses are taught. Some common teaching methods include face-to-face instruction, online learning, and blended learning.

2.2.8. Class Work Score

The score which reflects the student's standing during a term according to his performance in examinations, research, and other academic activities related to a particular course.

The Class Work Score typically refers to the evaluation or assessment of a student's performance in his regular class activities, assignments, and participation throughout the course. It is a measure of how well a student has engaged with the material, completed assignments, participated in discussions, and demonstrated his understanding of the subject matter during regular class sessions. The class work score contributes to the overall grade or evaluation of the student's performance in the course.

2.2.9. Final Examination

An examination in course materials, given once at the end of every term.

Final Examination is typically given at the end of a course. It is a major component of the final score for the course.

2.2.10. Final Examination Score

The score attained by a student in the final examination for each course.

The Final Examination Score refers to the score a student receives on his final examination for a particular course. The final examination is usually designed to assess the student's comprehensive understanding of the subject matter covered throughout the term. The final examination score often carries significant weight in determining the student's final grade for the course.

2.2.11. Final Score

The total sum of the class work score plus the final examination score for each course out of a total grade of 100.

The Final Score refers to the cumulative score that a student receives for a course. It takes into account various components such as class work, assignments, quizzes, tests, projects, and the final examination. The final score represents the student's overall performance and achievement

in the course, providing a comprehensive evaluation of his understanding and mastery of the subject matter.

2.2.12. Transcript

An official document that includes all the courses a student has taken at the University as of the date of its printing. It indicates course codes, numbers and credit hours, the grades earned by the student, term GPA, and cumulative GPA. In addition, it includes the list of courses and credits transferred, if any.

A transcript is an official document provided by a university that contains a comprehensive record of a student's academic history up to the date of its issuance. It includes detailed information about the courses the student has taken during his time at the university. The transcript typically includes essential details such as course title, course code, and the number of credit hours associated with each course. It also displays the grades earned by the student in each course. The transcript includes both letter grades and numerical grade point equivalents. Additionally, the transcript provides information about the student's term GPA for each term and his cumulative GPA, which represents his overall average performance throughout his academic career at the university. In some cases, the transcript may also include a section that lists courses and credits transferred from other educational institutions, if the student has completed coursework elsewhere and had it recognized or accepted for credit at the current university.

2.2.13. Visiting Student

A student who studies some courses at another university or branch of the university without transferring.

Visiting Student is a student who is enrolled in a course at another university or branch of the university. He is not officially enrolled in the university, but he is allowed to take courses there.

2.2.14. Grade

A percentage, or alphabetical letter, assigned indicating the final grade obtained by a student in a course.

A Grade refers to a numerical or alphabetical representation of a student's academic performance or achievement in a course. Grades range from A+ to F. Each grade corresponds to a specific level of achievement, with A representing excellent performance, and F indicating a failing grade.

2.2.15. Incomplete Grade

A provisional grade assigned to each course in which a student fails to complete the requirements by the required date. This is indicated in the transcript by the letter grade (IC).

Incomplete Grade is given to a student who is unable to complete the requirements for a course within the specified period.

2.2.16. In Progress Grade

A provisional grade assigned to each course which requires more than one term to complete. This is indicated in the transcript by the letter grade (IP).

In Progress Grade is a grade that is given to a course that is still in progress.

2.2.17. Term GPA

The total quality points a student has earned, divided by the credit hours assigned for all courses taken in a given term. Total quality points are calculated by multiplying the credit hours by the grade point in each course.

Term GPA is the grade point average that a student receives for a term. It is calculated by dividing the total quality points that the student earns by the total of credit hours for all courses taken in that term.

2.2.18. Cumulative GPA

The total quality points a student has earned in all the courses taken since enrolling at the University, divided by the total number of credit hours assigned for these courses.

2.2.19. General Grade

The assessment of a student's scholastic achievement during his study at the University.

General Grade is a description of the overall academic achievement of a student during his study period at the university.

2.2.20. Course Load

The total number of credit hours a student can register in a term where the minimum and maximum load is determined by the University executive regulations.

Course Load is the number of credit hours that a student is taking in a term. The course load is typically limited by the university to ensure that students do not overload themselves.

2.2.21. Enrollment termination

The act of suspending a student from continuing his studies by withdrawal, interruption or dismissal for reasons stipulated in the academic regulations and policies of the university.

Enrollment termination refers to the process of ending a student's enrollment or registration at the university. It is the act of officially discontinuing a student's active participation in his academic program or courses. Enrollment termination can occur for various reasons, such as voluntary withdrawal, failure to meet academic requirements, disciplinary reasons, or other circumstances outlined in the university's regulations and policies. When enrollment termination takes place, the student is no longer able to attend classes, access academic resources, or receive the benefits and privileges associated with being an enrolled student.

2.2.22. Academic dismissal

The termination of a student's enrollment from his studies as a result of receiving a specified number of academic probations or for exceeding the maximum regular study period, or for both reasons.

Academic dismissal is typically reserved for students who have failed to meet the academic requirements of the university, such as failing to maintain a minimum GPA, exceeding the maximum number of allowed withdrawals, or for exceeding the maximum regular study period.

2.2.23. Disciplinary dismissal

The termination of a student's enrollment from his studies due to the issuance of a disciplinary decision against him by the competent authority in accordance with the rules of student behavior and discipline at the University.

Disciplinary dismissal refers to the termination of a student's enrollment or studies due to severe disciplinary infractions or violations of the institution's code of conduct. It would typically involve actions that are significantly disruptive, harmful, or contrary to the values and policies of the institution.

2.2.24. Withdrawal

Withdrawal refers to the voluntary action taken by a student to officially discontinue his enrollment or registration in the university before completing the intended program or course of study.

When a student withdraws, he is no longer considered actively enrolled in the course or program, and he will lose privileges associated with being a registered student, such as access to campus resources or participation in academic activities. Students may choose to withdraw for various reasons, such as personal circumstances, health issues, financial concerns, or a change in academic or career plans. The process of withdrawal typically involves completing the necessary paperwork or online procedures provided by the university to officially notify them of the decision to withdraw. It is important for students to be aware of the specific deadlines, policies, and procedures related to withdrawal at the university. This ensures that the withdrawal is processed correctly, and the student's academic record reflects his decision to withdraw.

It is important to note that the term "withdrawal" is commonly used to formally indicate a student's decision to either drop all courses for a given term or to drop only one course within that term. In this context, the terms "apologizing" or "dropping" may also be used interchangeably to denote the action of withdrawing from a specific course or a set of courses, or even from an entire term.

2.2.25. Typical Study Plan

It is the distribution of the requirements of an academic program plan on terms.

A typical Study Plan is a document that outlines the requirements for completing the study of an academic program at the university. It specifies the courses that must be taken, the number of credit hours required, and the order in which the courses should be taken.

2.2.26. Regular study period

The specified period to complete the graduation requirements for an academic program according to the number of academic terms specified in the guideline plan for that program.

Regular study period is the amount of time that a student is expected to take to complete his academic program. The regular study period is typically determined by the number of academic terms specified in the guideline plan for the program.

2.2.27. Prerequisite

A condition that must be met before being able to register for a course, and may include the student's success in a course or a number of courses, or a certain number of credit hours.

A prerequisite is a course that must be completed before taking another course. Prerequisites are typically put in place to ensure that students have the necessary knowledge and skills to succeed in the subsequent course.

2.2.28. Equivalence

A process by which a student is considered to have passed a course within his academic study plan that he has not previously passed, if he has successfully completed another course that is equivalent or similar to the required course in his study plan. This process is governed by the regulations of the university.

Equivalence is the process of determining that two courses have similar content and learning outcomes. It allows students to transfer credits between institutions or colleges within the same university. Equivalence can also waive certain admission requirements for a program.

3. Career Opportunities

The Electrical Engineering Program aims to produce high-caliber engineers in various electrical engineering fields and qualify them for work in governmental, military, and industrial institutions in Saudi Arabia and beyond. The curriculum offered by the program is quite efficient as to be considered comparable to international engineering education standards. It is very difficult to make an exhaustive survey of the career opportunities available to the program graduates. A few representative examples of these opportunities are outlined below:

- Electric power generation stations.
- Transmission lines and substations for high and medium voltage.
- Load dispatch centers.
- Industrial complexes are heavily dependent on electric power utilization.
- Safe and effective distribution and consumption of electric power in residential areas and in factories.

- Energy resource management and programs for energy conservation.
- Computer-aided design and manufacturing systems

4. Research Opportunities

For students seeking to pursue graduate studies, the Academic Advisor may recommend a program, a graduate school for his student to enroll in Saudi or in foreign universities in a respective field. As a matter of fact, many EEP graduates have enrolled in a graduate program. A few have returned to the EE Department and they are currently faculty members, the others are expected to come back and join the academic team of the program within few years.

Degree Requirements and Curriculum

1. Introduction

This chapter is a crucial guide for students navigating their academic journey. It outlines the specific courses, credits, and standards needed to successfully earn a degree. Think of it as a roadmap that helps you stay on track and achieve your educational goals.

2. Academic Programs and Degrees Awarded

The Electrical Engineering Department (EED) offers only a Bachelor of Science (B.Sc.) degree in Electrical Engineering.

Table 2. Academic Programs and Degrees Awarded

Code	Program Name	Track 1	Degree Awarded
EE	Electrical Engineering Program	Electrical Power and Machines Engineering Track 2 Electronics and Communications Engineering	Bachelor of Science in Electrical Engineering

3. Curriculum Structure

3.1. Track 1: Electrical Power and Machines Engineering

Table 3. (Track 1: Electrical Power and Machines Engineering) - Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	5	10	6.45%
	Elective	2	4	2.58%
College Requirements	Required	11	37	23.87%
	Elective	0	0	0%
Program Requirements	Required	33	87	56.13%
	Elective	3	9	5.81%
Capstone Course/Project	Required	2	4	2.58%
Field Training/ Internship	Required	1	0	0%
Residency year		0	0	0%
Others (Free Courses)	Elective	2	4	2.58%
Total		59	155	100%

3.2. Track 2: Electronics and Communications Engineering

Table 4. (Track 2: Electronics and Communications Engineering) - Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	5	10	6.45%
	Elective	2	4	2.58%
College Requirements	Required	11	37	23.87%
	Elective	0	0	0%
Program Requirements	Required	33	87	56.13%
	Elective	3	9	5.81%
Capstone Course/Project	Required	2	4	2.58%
Field Training/ Internship	Required	1	0	0%
Residency year		0	0	0%
Others (Free Courses)	Elective	2	4	2.58%
Total		59	155	100%

4. Study Plan - Track 1

4.1. Academic Year-1

4.1.1. Level-1

Table 5. Study Plan - Level 1

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
MATH101	Calculus 1	R		4	3	0	2	College	حساب التفاضل والتكامل 1
LNGT101	English 1	R		4	20	0	0	College	اللغة الإنجليزية 1
IT100	Digital Culture	R		2	2	0	0	Institution	الثقافة الرقمية
ISLSxxx	Islamic Culture (1)	R		2	2	0	0	Institution	ثقافة اسلامية 1
Total				12	27	0	2	الإجمالى	

R/E: Required/ Elective. Type of requirements: Institution/ College/ Program. Other: can be Tutorial/Clinical

4.1.1. Level-2

Table 6. Study Plan - Level 2

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
MATH202	Calculus 2	R	MATH101	4	3	0	2	College	حساب التفاضل والتكامل 2
GNCR100	University Skills	R		2	2	0	0	Institution	المهارات الجامعية
LNGT102	English 2	R		4	20	0	0	College	اللغة الإنجليزية 2
LNGT103	English for Scientific and Engineering Purposes	R		2	4	0	0	College	اللغة الإنجليزية للأغراض العلمية والهندسية
Total				12	29	0	2	الإجمالى	

4.2. Academic Year-2

4.2.1. Level-3

Table 7. Study Plan – Level 3

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
MATH222	Linear Algebra	R	MATH101	3	3	0	0	College	الجبر الخطي
PHYS101	General Physics 1	R		4	3	2	0	College	الفيزياء العامة 1
MATH241	Differential Equations 1	R	MATH202	3	3	0	0	College	المعادلات التفاضلية 1
EE210	Electrical Circuits I	R	PHYS101 (co)	3	2	0	2	Program	الدوائر الكهربائية 1
EE200	Introduction to Computer Programming	R		3	2	2	0	College	مقدمة في برمجة الحاسب
xxxxxxxx	University Elective (1)	E		2	2	0	0	Institution	اختياري جامعة 1
Total				18	15	4	2	الإجمالي	

4.2.2. Level-4

Table 8. Study Plan – Level 4

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE220	Analytical Methods in Engineering	R	MATH241	3	2	0	2	Program	الطرائق التحليلية في الهندسة
EE221	Statistics and Probability for Electrical Engineers	R	MATH202	3	2	0	2	Program	الإحصاء والاحتمالات للمهندسين الكهربائيين
EE211	Electrical Circuits II	R	EE210	3	2	0	2	Program	الدوائر الكهربائية 2
EE212	Electrical Circuits Laboratory	R	EE211(co)	1	0	2	0	Program	معمل الدوائر الكهربائية
ISLSxxx	Islamic Culture (2)	R		2	2	0	0	Institution	ثقافة إسلامية 2
CHEM101	General Chemistry 1	R		4	3	2	0	College	الكيمياء العامة 1
Total				16	11	4	6	الإجمالي	

4.3. Academic Year-3

4.3.1. Level-5

Table 9. Study Plan – Level 5

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE322	Physics of Electricity and Magnetism	R	EE211, MATH202	3	2	0	2	Program	فيزياء الكهرباء والمغناطيسية
EE323	Numerical Methods in Engineering	R	MATH241	3	2	0	2	Program	الطرائق الحسابية في الهندسة
EE330	Electronics	R	EE211	3	2	2	0	Program	الكترونيات

EE331	Digital Logic Design	R	EE211	3	2	2	0	Program	تصميم المنطق الرقمي
HR100	Entrepreneurship	R		2	2	0	0	Institution	ريادة الأعمال
EE313	Signals and Systems Analysis	R	EE211, MATH241	3	2	0	2	Program	تحليل الإشارات والنظم
Total				17	12	4	6	الإجمالي	

4.3.2. *Level-6*

Table 10. Study Plan - Level 6

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE324	Electromagnetic Fields	R	EE322, EE220	3	2	0	2	Program	المجالات الكهرومغناطيسية
EE332	Microelectronics Devices and Circuits	R	EE330	3	2	0	2	Program	نبائط ودوائر الميكروإلكترونيات
xxxxxxx	University Elective (2)	E		2	2	0	0	Institution	اختياري جامعة 2
EE301	Structured Computer Programming	R		3	2	2	0	Program	برمجة الحاسب المهيكلة
EE302	Microcontrollers	R	EE200, EE331	2	1	2	0	Program	المتحكمات الدقيقة
EE390	Electrical Engineering Design	R	EE330	2	1	0	2	Program	تصميم الهندسة الكهربائية
Total				15	10	4	6	الإجمالي	

4.4. Academic Year-4

4.4.1. *Level-7*

Table 11. Study Plan - Level 7

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE440	Automatic Control Engineering	R	EE313	3	2	2	0	Program	هندسة التحكم الآلي
EE450	Electrical Power Systems I	R	EE324	3	2	0	2	Program	نظم القوى الكهربائية 1
EE460	Electromechanical Energy Conversion I	R	EE324	3	2	0	2	Program	التحويل الكهروميكانيكي للطاقة 1
EE470	Communication Systems	R	EE313	3	2	0	2	Program	نظم الاتصالات
EE471	Communication Systems Laboratory	R	EE470(co)	1	0	2	0	Program	معمل نظم الاتصالات
xxxxxx	Free Course 1	E		2	2	0	0	Institution	مقرر حر 1
Total				15	10	4	6	الإجمالي	

4.4.2. *Level-8*

Table 12. Study Plan - Level 8

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
CE201	Computer Aided Drawing	R		2	1	2	0	College	الرسم بالحاسب
EE414	Electrical Measurements and Instrumentation	R	EE330	3	2	2	0	Program	قياسات كهربية وأجهزة قياس

EE461	Electromechanical Energy Conversion II	R	EE460	3	2	0	2	Program	التحويل الكهروميكانيكي للطاقة 2
EE462	Electrical Machines Laboratory	R	EE461(co)	1	0	2	0	Program	معمل الآلات الكهربائية
EE433	Power Electronics I	R	EE330	3	2	2	0	Program	الكترونيات القوى 1
EE451	Renewable Energy	R	EE450	3	2	0	2	Program	الطاقة المتجددة
xxxxxx	Free Course 2	E		2	2	0	0	Institution	مقرر حر 2
Total				17	11	8	4	الإجمالي	

4.4.3. *Field Training*

Table 13. Study Plan - Field Training

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE491	Field Training	R	Dep. Approval & 110 credit hours	0	0	0	240	Program	تدريب ميداني
Total				0	0	0	240	الإجمالي	

4.5. Academic Year-5

4.5.1. *Level-9*

Table 14. Study Plan - Level 9

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE541	Programmable Logic Controller	R	EE302	3	2	2	0	Program	الحاكم المنطقي المبرمج
EE552	Electrical Power Systems II	R	EE450, EE461	3	2	0	2	Program	نظم القوى الكهربائية 2
EE553	Power systems Laboratory	R	EE552(co)	1	0	2	0	Program	معمل نظم القوى
EE592	Electrical Installations	R	EE450	2	1	2	0	Program	التركيبات الكهربائية
IE221	Engineering Economy	R		2	1	0	2	Program	اقتصاد هندسى
EE5xx	Program Elective I	E		3	2	0	2	Program	اختيارى برنامج 1
EE598	Capstone Project I	R	Dep. Approval & 120 credit hours	2	1	0	2	Program	مشروع تخرج 1
Total				16	9	6	8	الإجمالي	

4.5.2. *Level-10*

Table 15. Study Plan - Level 10

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE554	Electric Power Transmission and Distribution	R	EE552	3	2	0	2	Program	نقل وتوزيع الطاقة الكهربائية
EE555	Switchgear and Protection of Power System	R	EE552	3	2	2	0	Program	نظم الوقاية ومعدات القطع
ME465	Power Plants for Non-mechanical Engineers	R		3	2	0	2	Program	محطات القدرة لغير طلبة ميكانيكا
EE5xx	Program Elective II	E		3	2	0	2	Program	اختيارى برنامج 2
EE5xx	Program Elective III	E		3	2	0	2	Program	اختياري برنامج 3

EE599	Capstone Project II	R	EE598	2	1	1	1	Program	مشروع تخرج 2
Total				17	11	3	9	الإجمالي	

4.6. Elective Courses

4.6.1. University Elective Courses

*Table 16- University Elective Courses**

Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Other	
GNCR103	Kingdom & Its Pioneering Role	-	2	2	0		المملكة ودورها الريادي
ARAB103	Academic Writing Skills	-	2	2	0		مهارات الكتابة الأكاديمية
GNCR104	Fitness and Sport Science	-	2	2	0		اللياقة البدنية وعلوم الرياضة
BIO104	Sustainable Development	-	2	2	0		التنمية المستدامة
CUET101	Lifelong learning skills	-	2	2	0		مهارات التعلم مدى الحياة

*The student chooses two courses out of 5 courses.

4.6.2. University Elective Islamic Culture Courses

*Table 17- University Elective Islamic Culture Courses**

Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Other	
ISLS100	The origins of Islamic culture	-	2	2	0		أصول الثقافة الإسلامية
ISLS102	Studies in the Prophet's biograph	-	2	2	0		دراسات في السيرة النبوية
ISLS109	Medical jurisprudence	-	2	2	0		الفقه الطبي
ISLS104	The family in Islam	-	2	2	0		الأسرة في الإسلام
ISLS105	Professional ethics		2	2	0		أخلاقيات المهنة
ISLS106	Women and their developmental role		2	2	0		المرأة ودورها التنموي
ISLS107	Economic system		2	2	0		النظام الاقتصادي
ISLS108	Contemporary issues	-	2	2	0		قضايا معاصرة

*The student chooses two courses out of 8 courses.

4.6.3. Program Elective Courses Track 1

Table 18. Program Elective Courses (Track 1: Electrical Power and Machines Engineering)

Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Tutorial	
EE563	Electric Drive Systems	EE461, EE433	3	2	2	0	نظم التحريك الكهربائية
EE539	Power Electronics II	EE433	3	2	0	2	الكترونيات القوى 2
EE564	Electromechanical Energy Conversion III	EE461	3	2	0	2	التحويل الكهروميكانيكي للطاقة 2
EE565	Special Electrical Machines	EE461	3	2	0	2	الآلات الكهربائية الخاصة
EE566	Professional Safety	EE450	3	2	0	2	السلامة المهنية
EE567	Special Topics in Electrical Engineering I		3	2	0	2	موضوعات مختارة في الهندسة الكهربائية 1
EE556	Power System Transients	EE450	3	2	0	2	أنظمة القوى العابرة
EE557	High Voltage Engineering	EE450	3	2	0	2	هندسة الجهد العالي
EE558	Power Systems Economy	EE552	3	2	0	2	اقتصاد أنظمة القوى
EE559	Energy Efficiency	EE450	3	2	0	2	كفاءة الطاقة
EE508	Smart Grid and Enabling Technologies	EE552	3	2	0	2	الشبكات الذكية والتقنيات التمكينية
EE542	Advanced Control Systems	EE440	3	2	0	2	نظم التحكم المتقدمة

EE403	Introduction to Artificial Intelligence	EE301	3	2	0	2	مقدمة في الذكاء الإصطناعي
EE509	Computer Applications in Electrical Systems	EE552	3	2	0	2	تطبيقات الحاسب فى الأنظمة الكهربائية
EE543	Special Topics in Electrical Engineering II		3	2	0	2	موضوعات مختارة في الهندسة الكهربائية 2

4.7. Free courses

4.7.1. Free Courses

*Table 19- Free Courses**

Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Other	
IS101	Digital transformation	-	2	2	0		التحول الرقمي
ELP102	Leadership and change management	-	2	2	0		القيادة وإدارة التغيير
GNCR105	Volunteering and social responsibility	-	2	2	0		التطوع والمسؤولية المجتمعية
PSY115	Skills to deal with people with disabilities	-	2	2	0		مهارات التعامل مع ذوي الإعاقة

*The student chooses two courses out of 4 courses.

5. Study Plan - Track 2

5.1. Academic Year-1

5.1.1. Level-1

Table 20. Study Plan - Level 1

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
MATH101	Calculus 1	R		4	3	0	2	College	حساب التفاضل والتكامل 1
LNGT101	English 1	R		4	20	0	0	College	اللغة الإنجليزية 1
IT100	Digital Culture	R		2	2	0	0	Institution	الثقافة الرقمية
ISLSxxx	Islamic Culture (1)	R		2	2	0	0	Institution	ثقافة اسلامية 1
Total				12	27	0	2	الإجمالى	

R/E: Required/ Elective. Type of requirements: Institution/ College/ Program. Other: can be Tutorial/Clinical

5.1.2. Level-2

Table 21. Study Plan - Level 2

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
MATH202	Calculus 2	R	MATH101	4	3	0	2	College	حساب التفاضل والتكامل 2
GNCR100	University Skills	R		2	2	0	0	Institution	المهارات الجامعية
LNGT102	English 2	R		4	20	0	0	College	اللغة الإنجليزية 2
LNGT103	English for Scientific and Engineering Purposes	R		2	4	0	0	College	اللغة الإنجليزية للأغراض العلمية والهندسية
Total				12	29	0	2	الإجمالى	

5.2. Academic Year-2

5.2.1. *Level-3*

Table 22. Study Plan - Level 3

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
MATH222	Linear Algebra	R	MATH101	3	3	0	0	College	الجبر الخطي
PHYS101	General Physics 1	R		4	3	2	0	College	الفيزياء العامة 1
MATH241	Differential Equations 1	R	MATH202	3	2	0	2	College	المعادلات التفاضلية 1
EE210	Electrical Circuits I	R	PHYS101 (co)	3	3	0	0	Program	الدوائر الكهربائية 1
EE200	Introduction to Computer Programming	R		3	2	2	0	College	مقدمة في برمجة الحاسب
xxxxxxx	University Elective (1)	E		2	2	0	0	Institution	اختياري جامعة 1
Total				18	15	4	2	الإجمالي	

5.2.2. *Level-4*

Table 23. Study Plan - Level 4

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE220	Analytical Methods in Engineering	R	MATH241	3	2	0	2	Program	الطرائق التحليلية في الهندسة
EE221	Statistics and Probability for Electrical Engineers	R	MATH202	3	2	0	2	Program	الإحصاء والاحتمالات للمهندسين الكهربائيين
EE211	Electrical Circuits II	R	EE210	3	2	0	2	Program	الدوائر الكهربائية 2
EE212	Electrical Circuits Laboratory	R	EE211(co)	1	0	2	0	Program	معمل الدوائر الكهربائية
ISLSxxx	Islamic Culture (2)	R		2	2	0	0	Institution	ثقافة إسلامية 2
CHEM101	General Chemistry 1	R		4	3	2	0	CHEM101	General Chemistry 1
Total				16	11	4	6	الإجمالي	

5.3. Academic Year-3

5.3.1. *Level-5*

Table 24. Study Plan - Level 5

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE322	Physics of Electricity and Magnetism	R	EE211, MATH202	3	2	0	2	Program	فيزياء الكهرباء والمغناطيسية
EE323	Numerical Methods in Engineering	R	MATH241	3	2	0	2	Program	الطرائق الحسابية في الهندسة
EE330	Electronics	R	EE211	3	2	2	0	Program	الكترونيات
EE331	Digital Logic Design	R	EE211	3	2	2	0	Program	تصميم المنطق الرقمي
HR100	Entrepreneurship	R		2	2	0	0	Institution	ريادة الأعمال
EE313	Signals and Systems Analysis	R	EE211, MATH241	3	2	0	2	Program	تحليل الإشارات والنظم
Total				17	12	4	6	الإجمالي	

5.3.2. *Level-6*

Table 25. Study Plan – Level 6

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE324	Electromagnetic Fields	R	EE322, EE220	3	2	0	2	Program	المجالات الكهرومغناطيسية
EE332	Microelectronics Devices and Circuits	R	EE330	3	2	0	2	Program	نبائط ودوائر الميكروإلكترونيات
Xxxxxxx	University Elective (2)	E		2	2	0	0	Institution	اختياري جامعة 2
EE301	Structured Computer Programming	R		3	2	0	2	Program	برمجة الحاسب المهيكلة
EE302	Microcontrollers	R	EE200, EE331	2	1	2	0	Program	المتحكمات الدقيقة
EE390	Electrical Engineering Design	R	EE330	2	1	0	2	Program	تصميم الهندسة الكهربائية
Total				15	10	2	8	الإجمالي	

5.4. Academic Year-4

5.4.1. *Level-7*

Table 26. Study Plan – Level 7

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE440	Automatic Control Engineering	R	EE313	3	2	2	0	Program	هندسة التحكم الآلي
EE450	Electrical Power Systems I	R	EE324	3	2	0	2	Program	نظم القوى الكهربائية 1
EE403	Introduction to Artificial Intelligence	R	EE301	3	2	0	2	Program	مقدمة في الذكاء الاصطناعي
EE470	Communication Systems	R	EE313	3	2	0	2	Program	نظم الاتصالات
EE471	Communication Systems Laboratory	R	EE470(co)	1	0	2	0	Program	معمل نظم الاتصالات
xxxxxxx	Free Course 1	E		2	2	0	0	Institution	مقرر حر 1
CE201	Computer Aided Drawing	R		2	1	0	2	College	الرسم بالحاسب
Total				17	11	4	8	الإجمالي	

5.4.2. *Level-8*

Table 27. Study Plan – Level 8

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE434	VLSI Circuit Design	R	EE332	3	2	2	0	Program	تصميم الدوائر الرقمية المتكاملة واسعة النطاق
EE435	FPGA Laboratory	R	EE404(co)	1	0	2	0	Program	معمل الرقائق القابلة للبرمجة
EE404	Microprocessors	R	EE200, EE331	3	2	0	2	Program	المعالجات الدقيقة
EE405	Microprocessor and Microcontroller Laboratory	R	EE302 EE404(co)	1	0	2	0	Program	معمل المعالجات والمتحكمات الدقيقة

EE472	Digital Communication systems	R	EE470	3	2	0	2	Program	نظم الاتصالات الرقمية
EE414	Electrical Measurements and Instrumentation	R	EE330	3	2	2	0	Program	قياسات كهربية وأجهزة قياس
xxxxxx	Free Course 2	E		2	2	0	0	Institution	مقرر حر 2
Total				16	10	8	4	الإجمالى	

5.4.3. *Field Training*

Table 28. Study Plan - Field Training

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE491	Field Training	R	Dep. Approval & 110 credit hours	0	0	0	240	Program	تدريب ميداني
Total				0	0	0	240	الإجمالى	

5.5. Academic Year-5

5.5.1. *Level-9*

Table 29. Study Plan - Level 9

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE573	Antenna Theory	R	EE324	3	2	0	2	Program	نظرية الهوائيات
EE574	Antenna laboratory	R	EE573(co)	2	1	2	0	Program	معمل هوائيات
EE536	Introduction to Optoelectronic Devices and Systems	R	EE332	3	2	0	2	Program	مقدمة في الأنظمة والأجهزة الإلكترونية الضوئية
EE580	Digital Signal Processing	R	EE313	3	2	2	0	Institution	المعالج الرقمى الدقيق
EE5xx	Program Elective I	E		3	2	0	2	Program	اختياري برنامج 1
EE598	Capstone Project I	R	Dep. Approval & 120 credit hours	2	1	0	2	Program	مشروع تخرج 1
Total				16	10	4	8	الإجمالى	

5.5.2. *Level-10*

Table 30. Study Plan - Level 10

Course Code	Course Title	R/E	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Type of Requirements	Course Name in Arabic
					Theory	Lab	Tutorial		
EE541	Programmable Logic Controller	R	EE302	3	2	0	2	Program	الحاكم المنطقي المبرمج
EE506	Introduction to Embedded Systems	R	EE434	3	2	0	2	Program	مقدمة فى الأنظمة المدمجة
IE221	Engineering Economy	R		2	1	0	2	Program	اقتصاد هندسى
EE5xx	Program Elective II	E		3	2	0	2	Program	اختيارى برنامج 2
EE5xx	Program Elective III	E		3	2	0	2	Program	اختيارى برنامج 3
EE599	Capstone Project II	R	EE598	2	1	1	1	Program	مشروع تخرج 2
Total				16	10	1	11	الإجمالى	

5.6. Elective Courses

5.6.1. *University Elective Courses*

*Table 31- University Elective Courses**

Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Other	
GNCR103	Kingdom & Its Pioneering Role	-	2	2	0		المملكة ودورها الريادي
ARAB103	Academic Writing Skills	-	2	2	0		مهارات الكتابة الأكاديمية
GNCR104	Fitness and Sport Science	-	2	2	0		اللياقة البدنية وعلوم الرياضة
BIO104	Sustainable Development	-	2	2	0		التنمية المستدامة
CUET101	Lifelong learning skills	-	2	2	0		مهارات التعلم مدى الحياة

*The student chooses two courses out of 5 courses.

5.6.2. *University Elective Islamic Culture Courses*

*Table 32- University Elective Islamic Culture Courses**

Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Other	
ISLS100	The origins of Islamic culture	-	2	2	0		أصول الثقافة الإسلامية
ISLS102	Studies in the Prophet's biograph	-	2	2	0		دراسات في السيرة النبوية
ISLS109	Medical jurisprudence	-	2	2	0		الفقه الطبي
ISLS104	The family in Islam	-	2	2	0		الأسرة في الإسلام
ISLS105	Professional ethics		2	2	0		أخلاقيات المهنة
ISLS106	Women and their developmental role		2	2	0		المرأة ودورها التنموي
ISLS107	Economic system		2	2	0		النظام الاقتصادي
ISLS108	Contemporary issues	-	2	2	0		قضايا معاصرة

*The student chooses two courses out of 8 courses.

5.6.3. *Program Elective Courses Track 2*

Table 33. Program Elective Courses (Track 2: Electronics and Communications Engineering)

Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Tutorial	
EE581	Digital Image Processing	EE470	3	2	2	0	معالج الصور الرقمية
EE575	Optical Communication	EE472	3	2	2	0	الاتصال البصري
EE576	Special Topics in Electronics and Communication Engineering I		3	2	0	2	موضوعات خاصة في هندسة الإلكترونيات والاتصالات 1
EE577	Information Theory and Coding	EE580	3	2	0	2	نظرية المعلومات والترميز
EE507	Applications of AI and Machine Learning in Electrical Engineering	EE403	3	2	0	2	تطبيقات الذكاء الاصطناعي والتعلم الآلي في الهندسة الكهربائية
EE537	Electronic Warfare Principles	EE403	3	2	0	2	مبادئ الحرب الإلكترونية
EE538	Special Topics in Electronics and Communication Engineering II		3	2	0	2	موضوعات خاصة في هندسة الإلكترونيات والاتصالات 2
EE578	Fundamentals of Wireless Communication	EE572	3	2	0	2	أساسيات الاتصال اللاسلكي
EE582	Introduction to Radar Systems	EE573	3	2	0	2	مقدمة في أنظمة الرادار
EE583	Special Topics in Electronics and		3	2	0	2	موضوعات خاصة في هندسة الإلكترونيات والاتصالات 3

	Communication Engineering III						

5.7. Free Courses

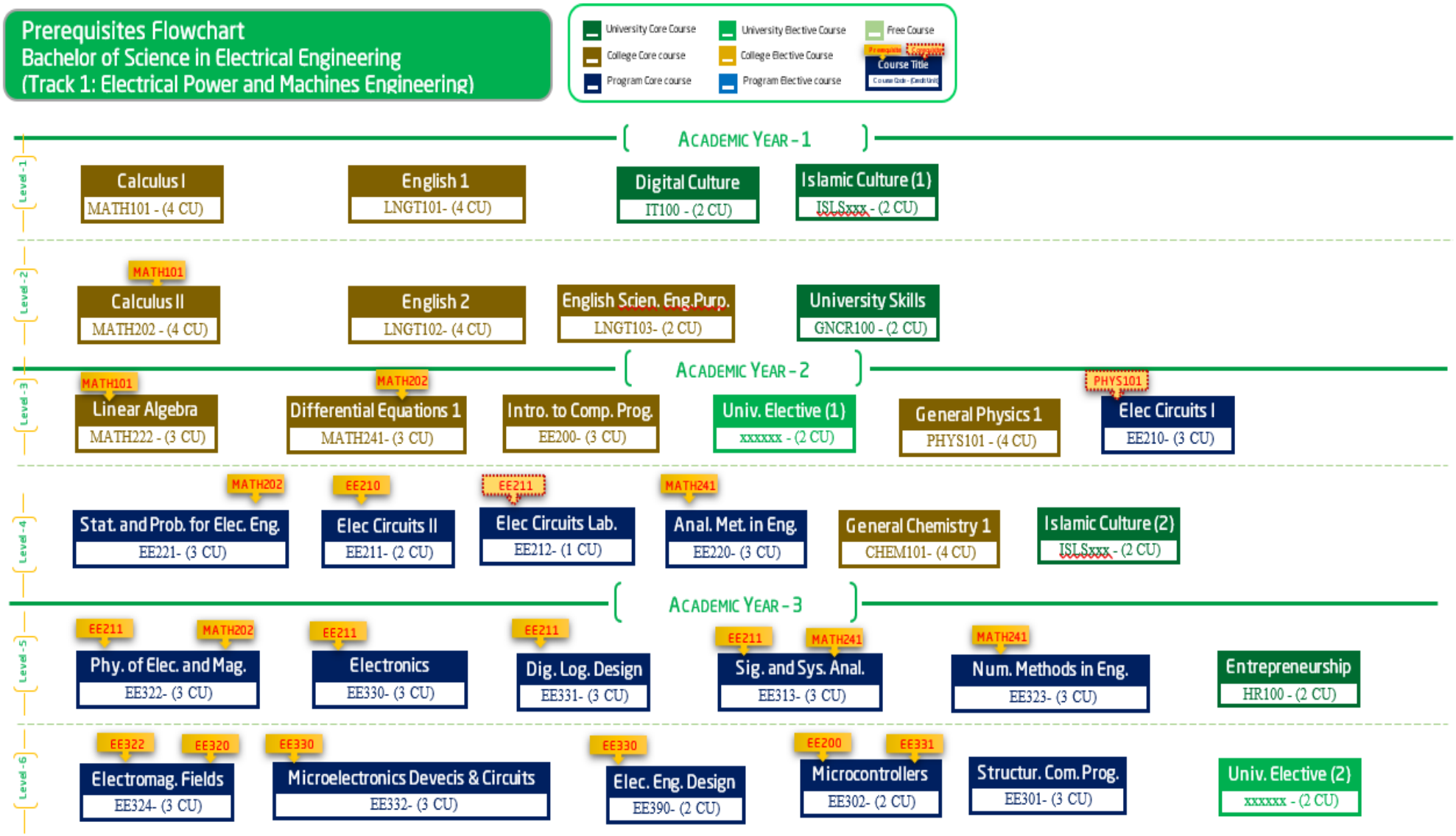
5.7.1. Free Courses

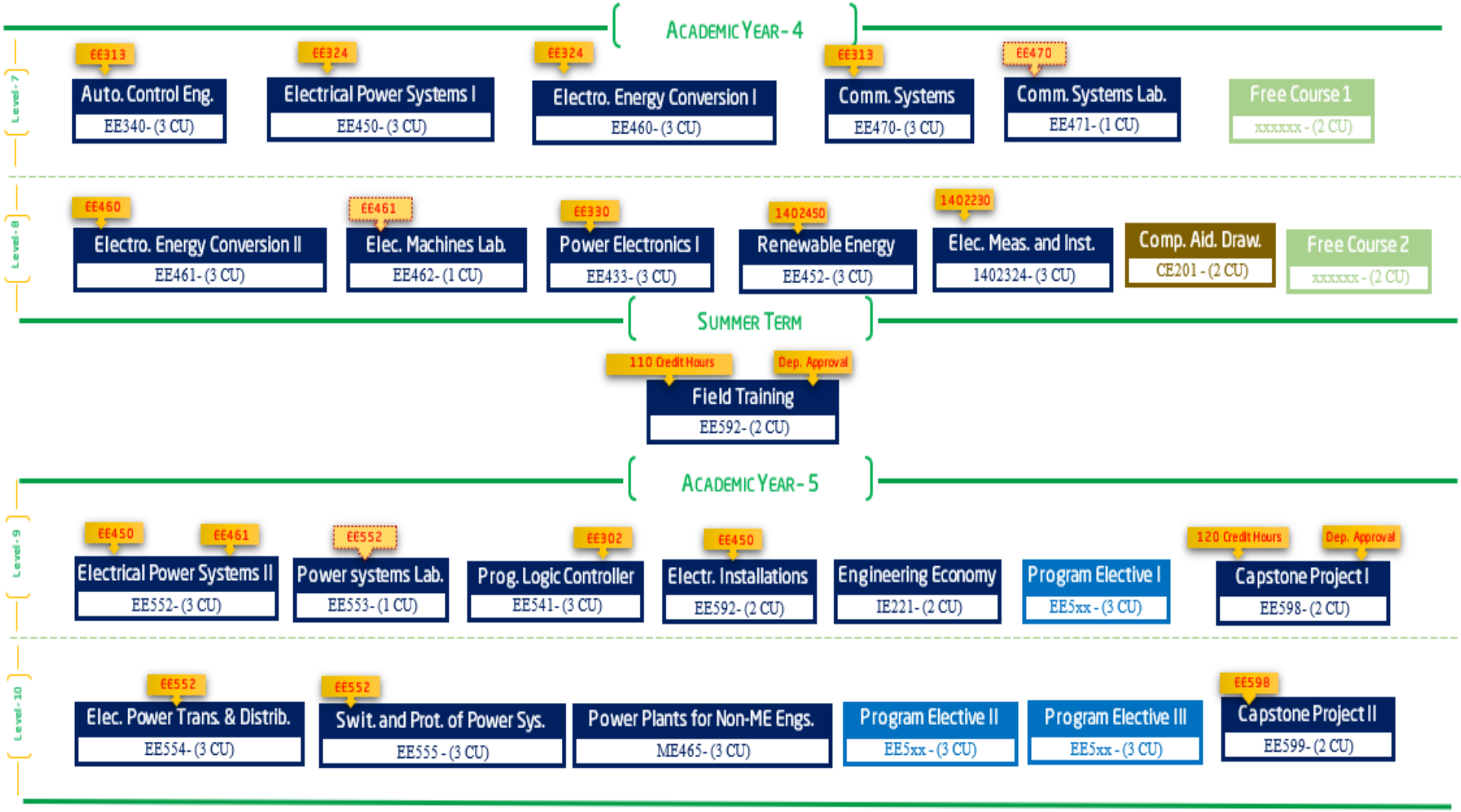
*Table 34- Free Courses**

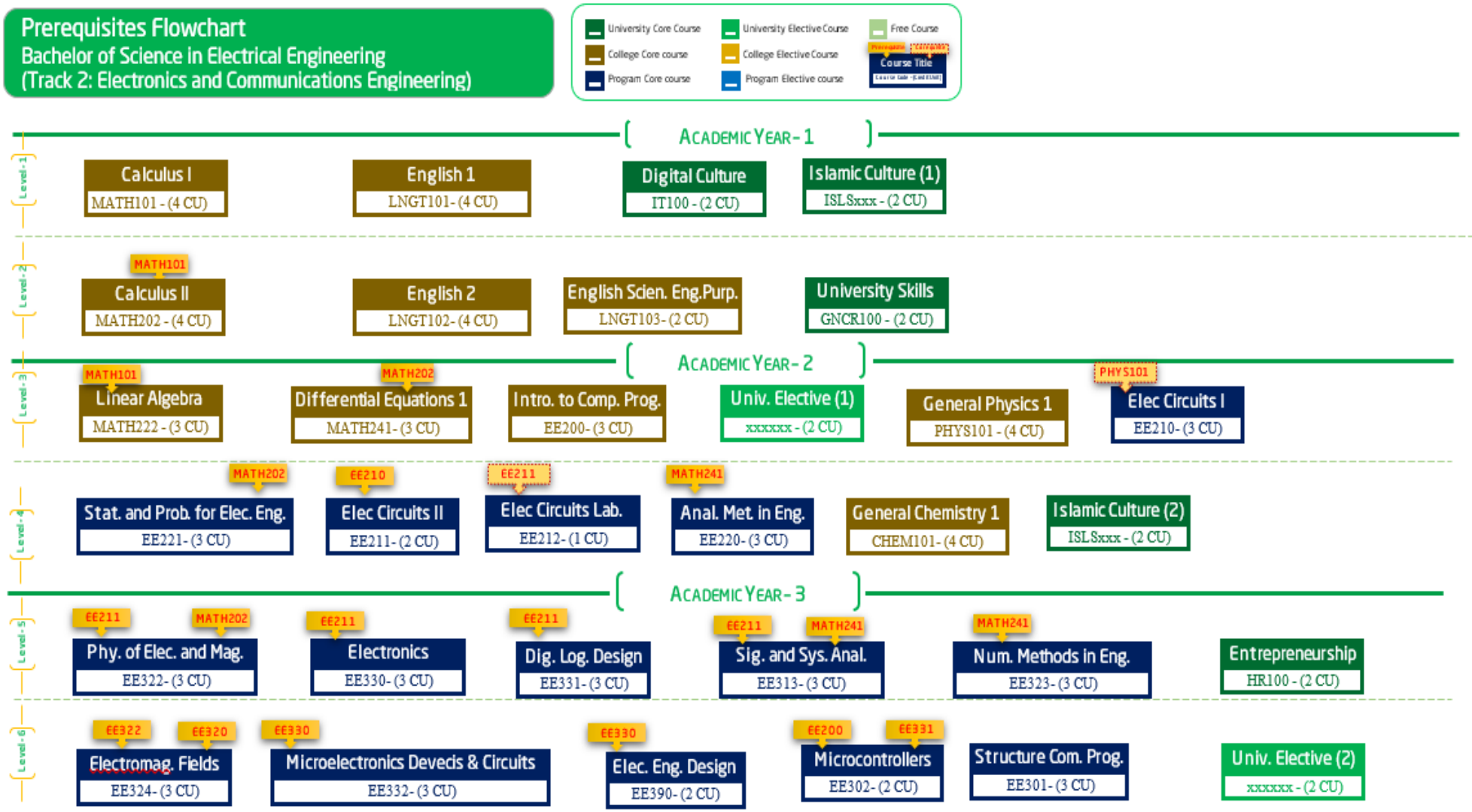
Course Code	Course Title	Pre-Requisite Courses Code	Credit Unit	Contact Unit			Course Name in Arabic
				Theory	Lab	Other	
IS101	Digital transformation	-	2	2	0		التحول الرقمي
ELP102	Leadership and change management	-	2	2	0		القيادة وإدارة التغيير
GNCR105	Volunteering and social responsibility	-	2	2	0		التطوع والمسؤولية المجتمعية
PSY115	Skills to deal with people with disabilities	-	2	2	0		مهارات التعامل مع ذوي الإعاقة

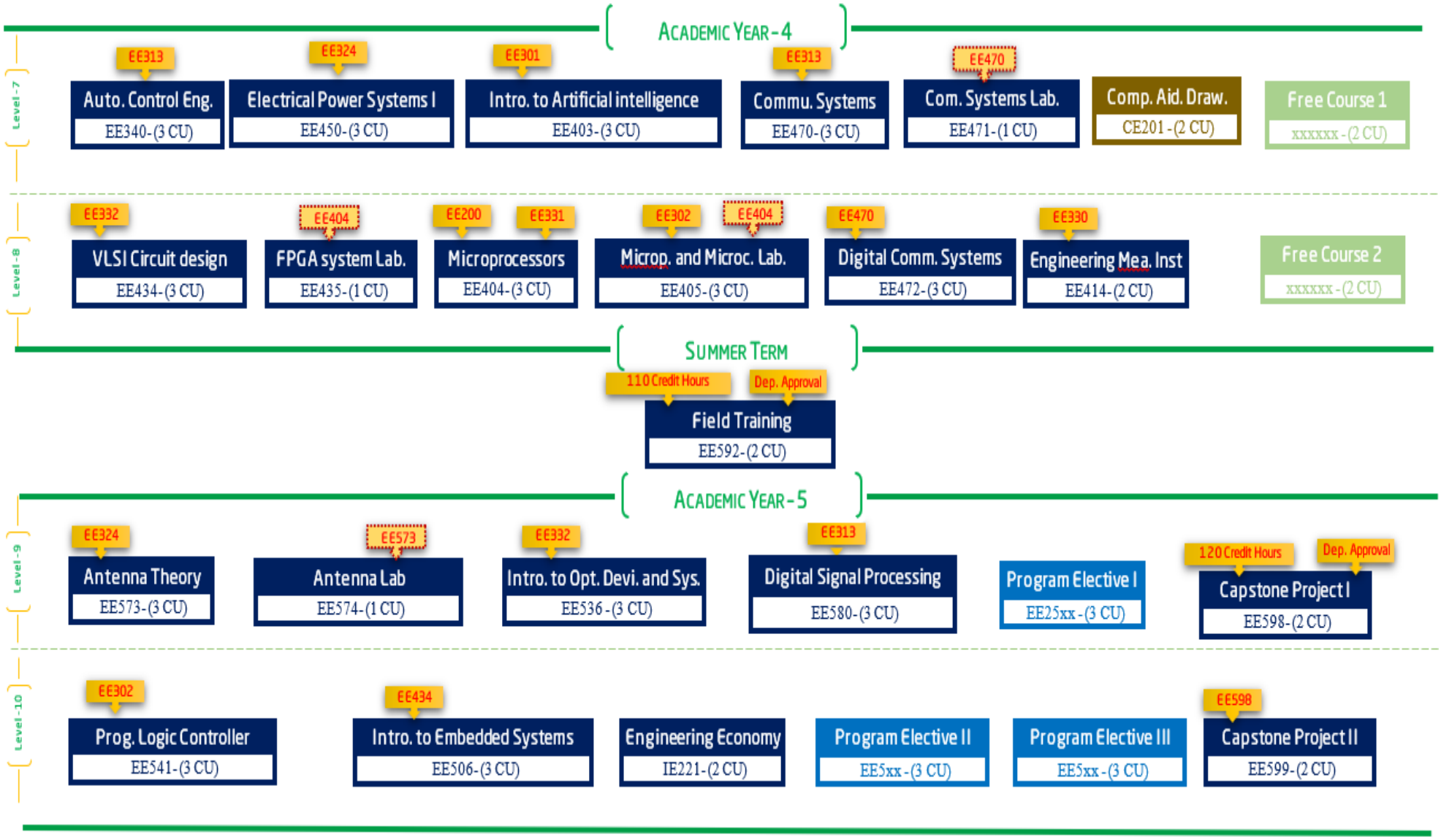
*The student chooses two courses out of 4 courses.

6. Flowchart of Prerequisites


Prerequisites Flowchart
Bachelor of Science in Electrical Engineering
(Track 1: Electrical Power and Machines Engineering)
University Core Course
University Elective Course
Free Course
College Core course
College Elective Course
Course Title
Program Core course
Program Elective course
ACADEMIC YEAR – 1
Level - 1
Calculus I
MATH101 - (4 CU)
English 1
LNGT101- (4 CU)
Digital Culture
IT100 - (2 CU)
Islamic Culture (1)
ISLSxxx - (2 CU)
Level - 2
MATH101
Calculus II
MATH202 - (4 CU)
English 2
LNGT102- (4 CU)
English Scien. Eng.Purp.
LNGT103- (2 CU)
University Skills
GNCR100 - (2 CU)
ACADEMIC YEAR – 2
Level - 3
MATH101
Linear Algebra
MATH222 - (3 CU)
MATH202
Differential Equations 1
MATH241- (3 CU)
Intro. to Comp. Prog.
EE200- (3 CU)
Univ. Elective (1)
xxxxxx - (2 CU)
General Physics 1
PHYS101 - (4 CU)
PHYS101
Elec Circuits I
EE210- (3 CU)
Level - 4
MATH202
Stat. and Prob. for Elec. Eng.
EE221- (3 CU)
EE210
Elec Circuits II
EE211- (2 CU)
EE211
Elec Circuits Lab.
EE212- (1 CU)
MATH241
Anal. Met. in Eng.
EE220- (3 CU)
General Chemistry 1
CHEM101- (4 CU)
Islamic Culture (2)
ISLSxxx - (2 CU)
ACADEMIC YEAR – 3
Level - 5
EE211
MATH202
Phy. of Elec. and Mag.
EE322- (3 CU)
EE211
Electronics
EE330- (3 CU)
EE211
Dig. Log. Design
EE331- (3 CU)
EE211
MATH241
Sig. and Sys. Anal.
EE313- (3 CU)
MATH241
Num. Methods in Eng.
EE323- (3 CU)
Entrepreneurship
HR100 - (2 CU)
Level - 6
EE322
EE320
Electromag. Fields
EE324- (3 CU)
EE330
Microelectronics Devecis & Circuits
EE332- (3 CU)
EE330
Elec. Eng. Design
EE390- (2 CU)
EE200
EE331
Microcontrollers
EE302- (2 CU)
Structur. Com. Prog.
EE301- (3 CU)
Univ. Elective (2)
xxxxxx - (2 CU)


ACADEMIC YEAR - 4
Level - 7
EE313
Auto. Control Eng.
EE340 - (3 CU)
EE324
Electrical Power Systems I
EE450 - (3 CU)
EE324
Electro. Energy Conversion I
EE460 - (3 CU)
EE313
Comm. Systems
EE470 - (3 CU)
EE470
Comm. Systems Lab.
EE471 - (1 CU)
Free Course 1
xxxxxx - (2 CU)
Level - 8
EE460
Electro. Energy Conversion II
EE461 - (3 CU)
EE461
Elec. Machines Lab.
EE462 - (1 CU)
EE330
Power Electronics I
EE433 - (3 CU)
1402450
Renewable Energy
EE452 - (3 CU)
1402230
Elec. Meas. and Inst.
1402324 - (3 CU)
Comp. Aid. Draw.
CE201 - (2 CU)
Free Course 2
xxxxxx - (2 CU)
SUMMER TERM
110 Credit Hours
Dep. Approval
Field Training
EE592 - (2 CU)
ACADEMIC YEAR - 5
Level - 9
EE450
EE461
Electrical Power Systems II
EE552 - (3 CU)
EE552
Power systems Lab.
EE553 - (1 CU)
EE302
Prog. Logic Controller
EE541 - (3 CU)
EE450
Electr. Installations
EE592 - (2 CU)
Engineering Economy
IE221 - (2 CU)
Program Elective I
EE5xx - (3 CU)
120 Credit Hours
Dep. Approval
Capstone Project I
EE598 - (2 CU)
Level - 10
EE552
Elec. Power Trans. & Distrib.
EE554 - (3 CU)
EE552
Swit. and Prot. of Power Sys.
EE555 - (3 CU)
Power Plants for Non-ME Engs.
ME465 - (3 CU)
Program Elective II
EE5xx - (3 CU)
Program Elective III
EE5xx - (3 CU)
EE598
Capstone Project II
EE599 - (2 CU)


Prerequisites Flowchart
Bachelor of Science in Electrical Engineering
(Track 2: Electronics and Communications Engineering)
University Core Course
University Elective Course
Free Course
College Core course
College Elective Course
Course Title
Program Core course
Program Elective course
ACADEMIC YEAR - 1
Level - 1
Calculus I
MATH101 - (4 CU)
English 1
LNGT101- (4 CU)
Digital Culture
IT100 - (2 CU)
Islamic Culture (1)
ISLSxxx - (2 CU)
Level - 2
MATH101
Calculus II
MATH202 - (4 CU)
English 2
LNGT102- (4 CU)
English Scien. Eng.Purp.
LNGT103- (2 CU)
University Skills
GNCR100 - (2 CU)
ACADEMIC YEAR - 2
Level - 3
MATH101
Linear Algebra
MATH222 - (3 CU)
MATH202
Differential Equations 1
MATH241- (3 CU)
Intro. to Comp. Prog.
EE200- (3 CU)
Univ. Elective (1)
xxxxxx - (2 CU)
General Physics 1
PHYS101 - (4 CU)
PHYS101
Elec Circuits I
EE210- (3 CU)
Level - 4
MATH202
Stat. and Prob. for Elec. Eng.
EE221- (3 CU)
EE210
Elec Circuits II
EE211- (2 CU)
EE211
Elec Circuits Lab.
EE212- (1 CU)
MATH241
Anal. Met in Eng.
EE220- (3 CU)
General Chemistry 1
CHEM101- (4 CU)
Islamic Culture (2)
ISLSxxx - (2 CU)
ACADEMIC YEAR - 3
Level - 5
EE211
MATH202
Phy. of Elec. and Mag.
EE322- (3 CU)
EE211
Electronics
EE330- (3 CU)
EE211
Dig. Log. Design
EE331- (3 CU)
EE211
MATH241
Sig. and Sys. Anal.
EE313- (3 CU)
MATH241
Num. Methods in Eng.
EE323- (3 CU)
Entrepreneurship
HR100 - (2 CU)
Level - 6
EE322
EE320
Electromag. Fields
EE324- (3 CU)
EE330
Microelectronics Devecis & Circuits
EE332- (3 CU)
EE330
Elec. Eng. Design
EE390- (2 CU)
EE200
EE331
Microcontrollers
EE302- (2 CU)
Structure Com. Prog.
EE301- (3 CU)
Univ. Elective (2)
xxxxxx - (2 CU)


ACADEMIC YEAR - 4
Level - 7
EE313
Auto. Control Eng.
EE340 - (3 CU)
EE324
Electrical Power Systems I
EE450 - (3 CU)
EE301
Intro. to Artificial intelligence
EE403 - (3 CU)
EE313
Commu. Systems
EE470 - (3 CU)
EE470
Com. Systems Lab.
EE471 - (1 CU)
Comp. Aid. Draw.
CE201 - (2 CU)
Free Course 1
xxxxxx - (2 CU)
Level - 8
EE332
VLSI Circuit design
EE434 - (3 CU)
EE404
FPGA system Lab.
EE435 - (1 CU)
EE200
EE331
Microprocessors
EE404 - (3 CU)
EE302
EE404
Microp. and Microc. Lab.
EE405 - (3 CU)
EE470
Digital Comm. Systems
EE472 - (3 CU)
EE330
Engineering Mea. Inst
EE414 - (2 CU)
Free Course 2
xxxxxx - (2 CU)
SUMMER TERM
110 Credit Hours
Dep. Approval
Field Training
EE592 - (2 CU)
ACADEMIC YEAR - 5
Level - 9
EE324
Antenna Theory
EE573 - (3 CU)
EE573
Antenna Lab
EE574 - (1 CU)
EE332
Intro. to Opt. Devi. and Sys.
EE536 - (3 CU)
EE313
Digital Signal Processing
EE580 - (3 CU)
Program Elective I
EE25xx - (3 CU)
120 Credit Hours
Dep. Approval
Capstone Project I
EE598 - (2 CU)
Level - 10
EE302
Prog. Logic Controller
EE541 - (3 CU)
EE434
Intro. to Embedded Systems
EE506 - (3 CU)
Engineering Economy
IE221 - (2 CU)
Program Elective II
EE5xx - (3 CU)
Program Elective III
EE5xx - (3 CU)
EE598
Capstone Project II
EE599 - (2 CU)

LABORATORIES

1. Introduction

EEP has 11 laboratories used for educational activities:

1- Power System Laboratory

2- Electrical Machine Laboratory

3- Power Electronics Laboratory

4- Basic Electrical Engineering Laboratory

5- Electronics Laboratory

6- Digital Systems Laboratory

7- Communications Laboratory

8- Microprocessors and Microcontrollers Laboratory

9- Electrical and Electronics Measurements Laboratory

10- Control Laboratory

11- Computer Laboratory

2. Power System Laboratory

In this laboratory, the basic power system and power system protection experimental work are performed. It covers the following experiments:

- Electrical power generation and generator characteristics
- Synchronization of alternators to network
- Active and Reactive load sharing of alternators in parallel
- Reactive power control and power factor correction
- Transmission line characteristics including different loading and fault conditions
- Double busbar system
- IDMT Over current relay characteristics and feeder protection

- Over/under voltage relay characteristics
- Transformer differential protection
- Reverse power relay characteristics
- Directional Earth Fault relay characteristics

This laboratory has 8-experimental workstations: 2 for generator characteristics, 2 for reactive power control and power factor correction, and 4-worksations for transmission lines and protection experiments.

Figure 1: Power System Laboratory

3. Electrical Machine Laboratory

The basic and advanced experimental tasks on standard electrical machines are performed with the electrical machines laboratory, which covers the following experiments:

- No load and short circuit of single-phase transformer .
- Evaluating efficiency of single-phase transformer under different loads.
- Connecting and investigating the behavior of a three-phase transformer in various types of circuits.
- Observation of the build-up process in separately excited and self-excited dc generator.
- No load and load Characteristics of dc generator.
- DC motor characteristics under different conditions.
- Speed control of dc motor by different techniques.

- Determining Efficiency and Recording Characteristics of synchronous motor.
- V-Curves and phase shift characteristics of synchronous motor.
- Characteristics of synchronous generator at different conditions.
- Synchronization test for synchronous generator.
- Determining the efficiency of three phase induction motor.
- Load characteristics of squirrel cage induction motor.
- Speed control for wound rotor induction motor

This laboratory has 4-workstations with similar equipment to conduct tests.

Figure 2: Electrical Machine Laboratory

4. Power Electronics Laboratory

The power electronic experiments accompany the Power Electronics course (EE433) and the elective course (EE5xx), both of which can be performed within the power electronic laboratory. Also, experimental work accompanied with the Capstone project (EE598, EE599) can be performed. The following experiments are included

- Single phase uncontrolled and controlled AC/DC converters ;
- Three-phase uncontrolled and controlled AC/DC converters

- Buck, boost and buck/boost choppers; Single phase DC/AC inverters; Three- phase DC/AC inverters
- The 4-quadrant operation of dc-motor based on 3-phase controlled converter
- The 4-quadrant operation of asynchronous-motor based on 3-phase inverter

There is a complete set of documentation for procedures covering each experiment stated above including student work and instructor directions. All the equipment is new and fulfills teaching requirements to an excellent extent.

Figure 3: Power Electronics Laboratory

5. Basic Electrical Engineering Laboratory

In this laboratory, the basic electrical laws and phenomena are demonstrated after being discussed in the Electrical Circuits I course (EE210), such as voltage, current, and power in DC circuits using KVL and KCL, Superposition, Thevenin and Maximum power transfer theorems in DC circuits, Series and parallel AC circuits. This laboratory is well equipped. At present, 12 groups (two to three students each) can be accommodated. After completing this laboratory, the students will be well familiarized with all types of circuit behavior and characteristics both in AC and DC. This laboratory covers the following experiments:

- Ohm's law, KVL and KCL, Series and parallel connection, RL, RC and RLC circuits ,
- Superposition and Thevenin, Nonlinear resistance, Norton application,

Figure 4: Basic Electrical Engineering Laboratory

6. Electronics Laboratory

In this laboratory, the basics of electronic devices are demonstrated after being discussed in the Electronics course (EE330), such as I-V characteristics of diode, clipping circuits using diodes, rectification using diodes, Zener diode and regulators, BJT DC biasing, BJT amplifier, MOSFET DC biasing and MOSFET amplifier. This laboratory can accommodate 12 groups (two to three students each) .

The laboratory covers the following experiments :

- Characteristics of diode (silicon and germanium)
- Rectifier using diodes (half wave and full wave)
- Clipping circuits
- Zener diode characteristics and application
- BJT characteristics
- BJT DC biasing
- BJT amplifier
- FET and MOSFET characteristics
- FET and MOSFET biasing
- FET and MOSFET amplifier

7. Digital Systems Laboratory

In the Digital Systems laboratory, the basics of digital logic are demonstrated after being discussed in the Digital Logic Design Course (EE331), such as logic gates, Implementation of Boolean functions using AND and OR gates, NAND and NOR implementation, XOR and adders, Design of combinational circuits, Flip-flops and Design of sequential circuits. This laboratory is well equipped with the latest equipment. Twelve groups (two to three students each) can be easily accommodated .

This laboratory enables the following experiments :

- Logic gates (AND, OR, NOT, NAND, NOR, XOR and XNOR)
- Implementation of Boolean functions, * De Morgan's laws
- Combinational circuits (half adder, full adder, encoder, decoder, multiplexer and demultiplexer)
- Flip flops (RS , D, T and JK), * Counters, * Shift registers

Figure 5: Digital Systems Laboratory

8. Communications Laboratory

In this laboratory, the basics of communications are demonstrated after being discussed in the Communication Systems Laboratory course (EE471), such as AM and FM modulation and detection, PAM, PPM, PCM and Delta modulation, TDM, ASK, FSK and Optical fiber parameter measurements. This laboratory is well equipped with the latest equipment. It can easily accommodate 8 groups (two to three students each) .

The laboratory covers the following experiments :

- AM modulation and demodulation, FM modulation and demodulation, PAM modulation and demodulation, PPM modulation and demodulation, PCM modulation and demodulation
- Delta modulation and demodulation, TDM
- ASK & FSK modulation and demodulation
- Optical fiber transmission and receiving

Figure 6: Communications Laboratory

9. Microprocessors and Microcontrollers Laboratory

Microprocessors and Microcontrollers are demonstrated in this laboratory after being discussed in the Microprocessors and Microcontrollers Laboratory course (EE405), such as their architecture, C/Assembly programming and machine code generation, RAM and EPROM, RS-232C serial port interface, Parallel I/O interface, Programmable I/O interfaces, DAC and ADC converters and Real time implementation. This laboratory also serves other programs in the EEP like the Communication and Computer Programs .

The laboratory can accommodate 8 groups (two to three students each) and enables the following experiments to be performed :

- Simple digital input output, Time delay subroutine, Timer operation, 7 segment displays
- Counters, Interrupt driven programs, DAC and ADC converters, RS-232C serial port interface
- Steeper motor control, DC motor control, Elevator control

Figure 7: Microprocessors and Microcontrollers Laboratory

10. Electrical and Electronics Measurements Laboratory

Various experiments are demonstrated after being discussed in the Electrical Measurements and Instrumentation course (EE414), such as Analogue multi meter, Digital multi meter, function generator and Oscilloscope and a wide range of sensors (Temperature, force, gas and proximity) .

The laboratory easily accommodates 12 groups of students and can be used for the following experiments:

- Photo diode and transistor
- Opto-coupler
- Distance measurement
- Temperature measurement: NTC, PTC and thermocouple
- Magnetic field sensors: hall effect
- Piezo electric sensor
- Load cell and force measurement
- Sound and ultrasound sensors
- Gas sensors
- Humidity sensors
- Proximity sensors: optical, inductive, capacitive and ultrasound

11. Control Laboratory

The basics of Automatic Control are demonstrated in this laboratory after being discussed in the Automatic Control Engineering course (EE440), such as Proportional controller, Differential controller, Integral controller, PID control, Control system simulation using Matlab and Modeling of physical experiments. These are treated in this laboratory to support control theory using physical processes. There is also a part for PLC elective course (EE542: Advanced Control Systems) in the laboratory covering its basics and how to program it, with a real live application (elevator control and Conveyer Belt Control) .

This laboratory enables the following experiments :

- Open loop control, Step response of a P-controller, Step response of an I-element
- Ramp response of the D-element, Output signals of an open loop chain, Feedback in control systems
- Control of a 1st order transfer element with P/PI-controller; Step response of an oscillating 2nd order transfer element; Dead time element, Time response of controllers, Temperature control, Liquid level control; Liquid flow control, Gas flow control, Brightness control, Speed control, Position control

Figure 8: Automatic Control Laboratory

12. Computer Laboratory

In this laboratory, the students study the Introduction to Computer Programming (EE200) that is a college requirement also Structured Computer

Programming course (EE301) as required program course. This second course is given with MATLAB. This laboratory also serves courses that need MATLAB in solving problems, such as Electrical Power Systems I (EE450). Twenty-one (21) personal computers are available to the students with licensed software installed on them.

Figure 9: Computer Laboratory

FACULTY

1. Introduction

The program's teaching staff includes members variously from Saudi Arabia, Tunisia, Egypt, and Sudan. Most of them hold PhD degrees and have valuable professional work experience in government or the private sector, and some are active in research programs and serve as reviewers on scholarly journals.

2. Program Faculty Members

The Electrical Engineering Program is ensured by thirteen faculty members. They are graduates of various fields in Electrical Engineering. The faculty members comprise Professor, Associate Professors and Assistant Professors. The faculty members, along with their qualification and activity, are given in the following table.

Table 35: Faculty Members

Faculty Members	Rank	Specialization	
		General	Specific
Mohamed Shaban Zaky Mohamed Sayedahmed	Professor	Electrical Engineering	Control of Electrical Machines
Ezzeddine Salah Youssef Touti	Associate Professor	Electrical Engineering	Power System - Electrical Systems Control
Ahmed Mahmoud Ali Agwa	Associate Professor	Electrical Engineering	Power Engineering and Electrical Machines
Yahia ElFahem Bechir Said	Associate Professor	Electrical Engineering	Electronics
Shaaban Mohammed Shaaban Awdallh	Associate Professor	Electrical Engineering	Engineering Mathematics
Hady El Said Mohamed Abdel Maksoud	Assistant Professor	Electrical Engineering	Electrical Machines
Habib Abdallah Kraiem	Associate Professor	Electrical Engineering	Electrical Systems and Control
Abdulaziz Furreh Alanazi	Associate Professor	Electrical Engineering	Electrical Power Systems
Ali Hamdan Alenezi	Associate Professor	Electrical Engineering	Communication
Muhannad Salem S Almutiry	Associate Professor	Electrical Engineering	Electrical Engineering

Mohammed Turki Alruwaili	Assistant Professor	Electrical Engineering	**Electrical Engineering**
Hafedh Zayani	Assistant Professor	Computer Science and Telecommunication	**Computer Science and Telecommunication**
Ahmed Saleh bin Qalil Al-Zahrani	**Assistant Professor**	Electrical Engineering	**Electronics**
Ahmed Fahad Qasim Al-Ruwaili	**Assistant Professor**	Electrical Engineering	**Electrical Engineering**
Ahmed Abdullah M. Alsheikhy	Associate Professor	Electrical Engineering	**Computer Engineering**
Dr. Hosam Elsaid	Assistant Professor	Electrical Engineering	**Communication**

Contact

Chairman of electrical engineering Department	Dr. Ali Hamdan Alenezi Phone : +966551450888 Cell Phone: +966-0560005253 E-mail : ali.hamdan@nbu.edu.sa
Dean of College of Engineering:	Dr. Yahya Saleh Yahya Alassaf Phone : +966146615888 Cell Phone: +966-0503383888 E-mail : yahya.alassaf@nbu.edu.sa

Appendices

Track 1 & 2:

	A- Compulsory Courses	Credits
1	**EE210: Electrical Circuits I**	3
	The course provides students with fundamental concepts of charge, current, voltage and power; passive circuit elements; mesh and nodal analysis; Thevenin's and Norton's theorems ; source transformation; transient analysis in time	
2	**EE211: Electrical Circuits II**	3
	The course covers a range of topics in electrical engineering, including complex numbers and phasor analysis, AC sinusoidal analysis, power calculations, balanced 3-phase circuits ,operational amplifier circuits and applications, circuits with magnetic coupling elements ,electrical transformer circuits, frequency responses, passive and active filter analysis and design ,and two-port networks. Students will learn how to analyze and design electrical circuits using these techniques and apply them to real-world problems.	
3	**EE212: Electrical Circuits Laboratory**	1
	The course objective is to provide students with the ability to develop and test electrical circuits practically and conduct basic electrical engineering experiments.	
4	**EE220: Analytical Methods in Engineering**	3
	The different subsections of this course are presented in the following order: complex numbers, analytic functions (limits, continuity, derivatives, Cauchy-Riemann equations , analytic functions, harmonic functions), Elementary functions (exponential, logarithm, complex exponents, trigs, hyperbolic functions), Integrals (definite integrals, contour integrals, Cauchy theorem, Cauchy integral formula), Series (sequences, convergence of series, Taylor series , Laurent series), Residues and poles (residues, Cauchy's residue theorem, residue at infinity, zeros of analytic functions). Classification of partial differential equations, solving partial differential equations with initial and boundary conditions using different methods.	
5	**EE221: Statistics and Probability for Electrical Engineers**	3
	This course covers the role of statistics and probability in electrical engineering. It includes the basic concepts of probability; random variables; discrete and continuous probability distributions (discrete; continuous and joint probability distributions); functions of random variables; the law of large numbers; the central limit theorem; sample mean and variance; estimating distributions; correlation; regression and hypothesis testing.	
6	**EE313: Signals and Systems Analysis**	3
	This course introduces different Types of Electrical signals in both Continuous time and discrete time states. Also, Fourier series, Fourier transform, Laplace transform, and z-transform are introduced to manage transformation of signals in different domains. The course demonstrates different types of electrical systems with special concern to clarify LTI system concepts such as impulse response, step Response convolution, transfer function, and frequency response. Finally, the course discusses sampling and Nyquist theorems used to convert analog signals into discrete time signals and hence to digital signals.	
7	**EE322: Physics of Electricity and Magnetism**	3

	This course provides the students with the basic principles of theories of vector algebra; Electric Fields; Gauss's Law; Electric Potential; Capacitance and Dielectrics; Current and Resistance ;Magnetic Fields and Biot-Savart Law.
8	**EE323: Numerical Methods in Engineering** 3
	This course covers the concepts and techniques for numerical methods and algorithms, Solution of non-linear equations-solution of large systems of linear equations, Interpolation, Curve fitting, Numerical differentiation and integration, and Solution of differential equations.
9	**EE330: Electronics** 3
	This course introduces semiconductors physics, which are the basics of electronic devices. It also introduces the concepts in the analysis and design of electronic circuits. The subsequent parts of this course are presented in the following order: an introduction to semiconductors physics, the construction of diode and its characteristics and application circuits; the construction of bipolar junction transistors (BJT) and its characteristics; operation modes of BJT; DC and AC analysis of BJT circuits; BJT application and circuits, the construction of field effect transistors (FET) and its characteristics; operation modes of FET; DC and AC analysis of FET circuits, and FET application and circuits.
10	**EE31: Digital Logic Design** 3
	The course describes the basic principle of logic design. The course enables the students to apply algebraic and graphical techniques such as Boolean Algebra and Karnaugh Maps among others. A wide variety of devices such as Multiplexers, Decoders, and encoders are studied for designing complex combination networks. Special emphasis on the study of flip-flops memory devices enables the student to design several sequential networks.
11	**EE301: Structured Computer Programming** 3
	This course presents MATLAB basics, built-in functions for the computation of mathematical formula, user-defined functions, various structured computer programs via the m-files of MATLAB.
12	**EE302: Microcontrollers** 2
	This is an introductory course in designing microcontroller-based systems. Topics include an overview of a single-chip microcontroller, hardware and software concepts in microcontroller, system architecture, central processing unit (CPU), internal memory (ROM, EEPROM, RAM, FLASH), Input/ Output ports, serial communication, programmable interrupts and timers, microcontroller programming model and instruction set, assembly language programming.
13	**EE324: Electromagnetic Fields** 3
	This course aims to provide the student with the fundamentals and theories of Magnetic field. Magnetic forces and torques, Biot-Savart law; Force between parallel conductors; Ampere's law; Magnetic boundary conditions; Inductance; Magnetic energy; Time Varying Fields: Faraday's Law; Stationary Loop in Time-Varying Magnetic Field; Ideal Transformer; Moving Conductor in Static Magnetic Field; Moving Conductor in Time-Varying Magnetic Field; Continuity Equation will be attained; Finally, Maxwell's Equations and Hertz's Discoveries; Plane Electromagnetic Waves; Energy Carried by Electromagnetic Waves.
14	**EE332: Microelectronics Devices and Circuits** 3
	This course includes frequency response of BJT and MOSFET amplifiers, Feedback in amplifiers, Differential amplifier, Current Mirror, Operational amplifiers (design and applications as linear and non-linear analog building blocks), adders, subtractors, differentiators, integrators, analog simulation, Logarithmic and exponential amplifiers, Op-amp frequency response, precision converters, analog multipliers,

	Sinusoidal oscillators, Introduction to nano-electronics and comparison of microelectronic and nano-electronic devices.
15	**EE390: Electrical Engineering Design** 2
	This course describes the concepts and principles of Electrical Engineering Design, Introduction to the design process, problem-solving skills, and practices dealing with open-ended problems. Also, this course enforces the skills in teamwork, group dynamics, critical thinking, planning, scheduling, and written/oral communications through the design of mini project.
16	**EE440: Automatic control engineering** 3
	This course introduces different concepts in the analysis and synthesis of control systems. The subsequent parts of this course are presented in the following order: an introduction to automatic control systems with various examples of real controlled systems is addressed in the first part, while modeling of these systems by means of transfer functions and signal flow graphs is presented in the second part. The other parts are devoted especially to the stability analysis, the industrial controllers' synthesis and the performance study of automatic control systems in their closed-loop architecture.
17	**EE450: Electrical Power Systems I** 3
	This course introduces the basic concepts and fundamentals of the generation, transmission and distribution in Electrical Power Systems. Also, it presents the transmission Line Parameters, Line Model and Performance, Complex Power Flow, and Per-unit Systems model.
18	**EE460: Electro-mechanical energy conversion I** 3
	This course provides students with theory of electromechanical energy conversion, Magnetic circuit, Physical construction and applications of DC machines, types of dc machines, characteristics of dc machines, Starting and control of dc machines. Also, Construction and applications of power transformers, types of transformers, equivalent circuit of power transformer, voltage regulation and efficiency of transformer, and transformer parallel operation.
19	**EE470: Communication Systems** 3
	This course introduces and emphasizes major communication system analytical tools and theories for signal transmission through linear systems. It covers recalling Fourier series and Fourier transforms, analog communications (Amplitude Modulation (AM) and Angle Modulation (FM and PM), an introduction to digital communication (BPSK, BFSK, OOK, and M-ary modulation). Then, the sampling theorem, quantization process, and encoding process are covered as keys to recognize PCM system
20	**EE471: Communications Systems laboratory** 1
	This course practically emphasizes analog communications (Amplitude Modulation (AM) and Angle Modulation (FM and PM) Followed by digital communication (BPSK, BFSK, OOK) experiments.
21	**EE414: Electrical Measurements and instrumentation** 3
	The course provides students with a background in electrical and electronic measurements and instrumentation. Terms related to electrical measurements are investigated. The function elements of a general measuring instrument are introduced. Principles, limitations, and applications of analog DC and AC ammeters and voltmeters will be studied. Ohmmeters, DC and AC bridges are analyzed. The principle of operation and construction of the oscilloscope and function generator will be investigated. Electronic and digital measurement systems will also be given some consideration.
22	**EE433: Power Electronics I** 3

	This course provides students with the classifications of power electronic circuits, power semiconductor devices characteristics, design uncontrolled and controlled single phase rectifiers, analysis of uncontrolled and controlled three phase rectifier circuits, analysis of AC voltage controllers, study the behavior of DC-DC converters, Introduction to frequency converters and inverter.
23	**EE451: Renewable Energy** 3
	This course presents renewable energy conversion systems with an overview of today's energy use, fossil fuels and environmental impact, renewable energy sources and their applications in electrical power generation. Also, it discusses different renewable energy sources including Solar Energy: (Solar radiation, Solar thermal energy conversion and applications, Concentrated solar power (CSP), Photovoltaics (Solar cells)), Biomass and Bioenergy: (Biomass types, Conversion processes and production), Wind Energy: (Introduction of wind energy, Wind turbines, wind farms, and power control, Wind energy conversion system, Wind power), Hydropower: (Hydropower types, Water sources, and power), Energy Storage: {Energy storage systems components and applications, Flywheel Energy, Pumped hydro, Superconducting magnetic energy storage (SMES), Batteries types and specifications, Hydrogen and Fuel Cells: (Basics of electrochemistry, Polymer membrane electrolyte (PEM) fuel cells, Fuel cells' electrical characteristics).
24	**EE461: Electro-mechanical energy conversion II** 3
	This course provides students with, Physical construction and applications of Induction machines, types of induction machines, Equivalent circuit of induction motor, performance of induction motor, Starting and speed control of induction motor. Also, Construction and applications of synchronous generator, Armature winding for a.c machines, induced emf equation of synchronous generator, voltage regulation and efficiency of synchronous generator, and synchronous generator parallel operation.
25	**EE462: Electrical Machines Lab** 1
	This course covers the following parts: No-load and short circuit tests for single phase transformer, Load characteristics of single phase transformer, Different connections for three phase transformer, Voltage build up for dc generator, No-load and load characteristics of dc generator, Study the performance of dc motor under different conditions, Study the performance of synchronous motor under different conditions, V-curves of synchronous motor, No-load and short circuit tests for synchronous generator, Study the performance of induction motor under different conditions, Speed control of induction motor.
26	**EE541: Programmable Logic Controller** 3
	This course provides students with an introduction to Programmable Logic Controller (PLC) and their applications in industrial settings. The course covers the basics of PLC, including input/output devices such as sensors, transducers, and actuators, as well as programming elements such as timers, counters, comparators, sensors, and actuators. Students will design ladder diagrams and program a PLC to control industrial processes and explore the different applications of PLC in manufacturing, production, quality control, and other relevant areas through case studies.
27	**EE552: Electrical Power System II** 3
	This course presents performance analysis methods for power systems. The Course covers the fault analysis for both symmetrical and unsymmetrical faults, sequence networks. Then, it presents the definition of Load flow problem, how to solve the load flow equations by using Gauss-Seidel, Newton-Raphson, and Fast-Decoupled techniques. Finally, the course introduces the power system stability issue including steady-state and transient stability problem.
28	**EE553: Power System Laboratory** 1

	This course provides students with Transmission Line Model, Transmission Line at no-load, Faults on Transmission Line, Methods of earthing, Reactive Power Compensation (series and shunt Compensation), 3-phase Alternator, Characteristics of isolated alternator, Characteristics of alternator coupled to network, Manual synchronization, Automatic synchronization circuits, Active and reactive power sharing.
29	**EE592: Electrical Installation** 2
	This course provides students with Basic electrical system installation and load calculation for residential, office and commercial buildings. Concept of light, vision, and color. Luminaries and lamps. Lighting system design procedures; calculation and measurement techniques, evaluation of interior lighting quality, and daylighting. Grounding methods for different buildings. The course features an electrical design mini-project where students are required to develop and present a basic set of electrical design documents for a medium-size building.
30	**IE221: Engineering Economy** 3
	Engineering Economy introduces fundamental concepts and techniques for making sound economic decisions in engineering projects. The course covers topics such as the time value of money, interest rates, cash flow analysis, benefit-cost analysis, risk analysis, and depreciation. Students will gain the skills to evaluate project proposals, allocate resources, and assess the financial feasibility of engineering investments. Engineering Economy provides a practical foundation for making informed economic decisions in engineering contexts.
31	**EE554: Electric Power Transmission and Distribution** 3
	The course provides students with all details of two methods of electric power transmission (overhead lines, cables, and the transmission line parameters). In this context, the course includes the following items, suspension insulators of overhead transmission lines, corona discharge, surges on transmission systems, load characteristics, and underground cables. Besides, system grounding is provided. Nevertheless, in the last part of the course, distribution systems are addressed namely, the design of distribution systems complied with the Saudi Arabian Distribution Code.
32	**EE555: Switchgear and Protection of Power System** 3
	This course provides students with the basic power system protection techniques. It includes the following items, general philosophy of power system protection, circuit breakers, fuses, current transformers, voltage transformers, protective-relay technology, various principles of power system protection (over-current, distance, and differential protection), protection of various apparatuses (transmission lines, transformer, busbar, generator, and induction motor).
33	**ME465: Plants for Non-mechanical Engineers** 3
	Fundamentals of thermodynamics, Properties of pure substances, heat and work, First Law of thermodynamics. Applications of first law on closed system and control volume. Second Law of thermodynamics. Power Cycles. Steam cycles, Diesel and gas turbine cycles, Combined cycle power plant. Performance of power plant components, Power Plant Economy: (Load curves, plant selection, Energy rates)
34	**EE403: Introduction to Artificial Intelligence** 3
	This course provides students with fundamental concepts and techniques of intelligent systems. Topics include knowledge representation and interpretation, search strategies and control, active research and applications in intelligent agents and expert systems.
35	**EE440: Automatic control engineering** 3
	This course introduces different concepts in the analysis and synthesis of control systems. The subsequent parts of this course are presented in the following order:

	an introduction to automatic control systems with various examples of real controlled systems is addressed in the first part, while modeling of these systems by means of transfer functions and signal flow graphs is presented in the second part. The other parts are devoted especially to the stability analysis, the industrial controllers' synthesis and the performance study of automatic control systems in their closed-loop architecture.
36	**EE404: Microprocessor** 3
	This course covers the basic concepts of Microprocessor, including designing microprocessor-based systems, an overview of a microprocessor, hardware and software concepts, system architecture, central processing unit (CPU), internal memory (ROM, EEPROM, RAM, FLASH), Input/ Output ports, serial communication, programmable interrupts and timers, microprocessor programming model and instruction set, assembly language programming.
37	**EE405: Microprocessor and Microcontroller Laboratory** 1
	This course covers the basic concepts of Microprocessor, including designing microprocessor-based systems, an overview of a microprocessor, hardware and software concepts, system architecture, central processing unit (CPU), internal memory (ROM, EEPROM, RAM, FLASH), Input/ Output ports, serial communication, programmable interrupts and timers, microprocessor programming model and instruction set, assembly language programming.
38	**EE434: VLSI Circuit Design** 3
	This course covers MOS transistor structure and device modeling, MOS Inverters, MOS Combinational Circuits, Device feature size scaling, Multi-Vdd Circuits, Dynamic voltage scaling, Power Management, Hardware Software Trade-off, Bus Encoding, Architectural optimization, Clock Gating, Logic styles, Variable-threshold-voltage CMOS (VTCMOS) approach, Multi threshold-voltage CMOS (MTCMOS) approach, Power gating, Transistor stacking, Dual-Vt assignment approach (DTCMOS), Adiabatic Switching Circuits, Battery-aware Synthesis, Variation tolerant design, and Simulation tools for low power synthesis.
39	**EE435: FPGA Laboratory** 1
	This course covers some practical experiments on modeling style and synthesis results, implementation of simple combinational design, design a Full Adder, 4-bit Adder, seven segment display, 3 to 8 Decoder, Up Counter, Up-Down Counter, implement a traffic light control circuit, FPGA system design using IP Integrator.
40	**EE472: Digital Communication** 3
	The Digital Communication Systems course focuses on the principles and techniques of digital communication systems, including Pulse-Code Modulation (PCM), M-ary modulation, and baseband and band-pass signal analysis. Students will explore the factors affecting binary signals and M-ary pulse waveforms, such as error probability, additive white Gaussian noise (AWGN), inter-symbol interference, and distortion. The course also provides a comparison between Amplitude, Frequency, and Phase Shift-Keying modulations and analysis of binary encoding formats. This course combines theoretical concepts with practical applications, enabling students to design and analyze digital communication systems.
41	**EE536: Introduction to Optoelectronics Devices and Systems** 3
	This course focuses on review of Maxwell's equations; plane wave in simple media; Physics of optical radiation; interaction between optical radiation and matter; principles and applications of optoelectronic devices: sources, detectors as well as other optical materials, devices, components and equipment; wave optics; ray optics; beam optics; nano-photonics; and lasers.
42	**EE573: Antenna Theory** 3

	This course presents the fundamental principles of antenna theory, analysis, design, and measurements of antennas, structures of antenna, applications of the most basic and practical configurations, such as linear dipoles; loops; arrays; aperture antennas; horn antennas; micro strip antennas; and reflector antennas.	
43	**EE574: Antenna Laboratory**	1
	An antenna laboratory course typically provides students with hands-on experience in the design, fabrication, measurement, and analysis of various types of antennas. The course may be offered as an elective or as part of a larger program in electrical engineering, telecommunications engineering, or related fields.	
44	**EE580: Digital Signal Processing**	3
	This course covers the basic concepts of digital signal processing including discrete-time signals and systems, the z-transform, design of analog filters, and design and implementation of digital filters.	
45	**EE506: Introduction to Embedded Systems**	3
	This course introduces students to the fundamentals of the hardware and firmware architecture of embedded systems and their applications. It includes a comprehensive overview of the PIC and AVR microcontrollers, their architecture, interfacing, programming, and usage. In addition, the course provides students with an insight of embedded systems, real-time operating systems, development boards, sensors and actuators, embedded systems in real time, and embedded systems applications (IoT).	
46	**EE598: Capstone Project I**	2
	Senior Project 1 (SP1) is the first of a two-course sequence designed to provide undergraduate electrical engineering students with hands-on experience in tackling a complex engineering project from conception to completion. Working within a team environment, students will learn to research a chosen problem, define tasks and timelines, identify and secure necessary resources, establish project milestones, and communicate effectively through written and oral presentations. SP1 focuses primarily on selecting and analyzing a challenging electrical engineering problem, exploring design tradeoffs at various stages, and ensuring all necessary equipment is secured for the subsequent project phase.	
47	**EE599: Capstone Project II**	2
	Senior Project 2 is the culmination of your electrical engineering design journey. In this project, you will build upon the foundation established in Project 1 and translate your conceptual design into a tangible working system or prototype. By refining their design proposals, incorporating safety and environmental considerations, and meticulously prototyping their ideas, students will develop a working system or prototype. Through rigorous testing, clear documentation, and engaging presentations, they will showcase their engineering prowess and prepare for their future careers.	
	B- Elective Courses	Credits
48	**EE539: Power Electronics II**	3
	This course aims to make graduates aware of gate drive circuits, Buck-boost Converters, single and three phase inverters, Uninterruptible Power Supplies, Power Factor Improvement, Power Electronics for Renewable Energy Sources.	
49	**EE563: Electrical Drive Systems**	3
	This course describes the concepts and principles of electrical drive systems, components of drives, mechanical characteristics of loads, four quadrant operation, equivalent drive parameters, starting of electric motor (soft starting), breaking and reversing, and dynamic characteristics, open loop and closed loop systems, electric motor selection, Speed Torque Characteristics of DC Motor Using Half and full	

	Controlled Rectifiers, Multi-quadrant Operation of DC Motor , Speed control of induction motor using stator voltage regulator, Variable voltage variable frequency control, Open loop V/F control, Slip speed control of induction motor, Constant Volt/Hz control with slip speed regulation
50	**EE564: Electro-mechanical energy conversion III** 3
	This course aims to make graduates aware of the basic principles of electrical machine design. The course discusses the different aspects in designing dc machines, three phase salient and non-salient synchronous machines and three phase induction motors.
51	**EE565: Special Electrical Machines** 3
	This course presents a general overview of Special Electrical Machines; Single-phase induction motors, AC Commutator motors: universal motor, repulsion motor, Synchronous reluctance motors, Switched reluctance motors, Servo motors – Steppers motors. Dynamics of Electrical Drives, Selection of motor power rating.
52	**EE566: Professional Safety** 3
	This course presents a general awareness of common electrical hazards associated with electricity. It also covers the effects of electricity on the human body, electrical hazard analysis, causes of electrical accidents, electrical safety controls and their hierarchy, methods to protect the workers, safe work practices, circuit protection devices, precautions for electrical safety at workplace, direct contact, indirect contact, earthing system, grounding computation
53	**EE508: Smart Grid and Enabling Technologies** 3
	This course describes principles and technologies of smart grid systems, including power systems basics, smart grid definition, objectives, and benefits, communication networks, demand response, renewable energy integration and management, wide area measurement, security, privacy, and economics and market operations
54	**EE556: Power System Transients** 3
	This course provides students with transients in lumped circuits, lightning strokes, shielding, back flashovers, switching transients and temporary over voltages, current interruption in AC circuits, travelling waves, transient behavior of synchronous generators, flicker, bus transfer, transients in low-voltage and grounding systems, surge arresters, horn gap.
55	**EE557: High Voltage Engineering** 3
	The course provides students with the basic knowledge and skills of high voltage engineering. In this context, the course includes the following items breakdown mechanism (in gas, liquid and solid). Additionally, this course includes high voltage generation and measurements (DC, AC, and impulse types).
56	**EE558: Power Systems Economy** 3
	The course introduces operating constraints, short-term load forecast, load curve analysis, economical load sharing between units and between stations, tariffs, incremental costs, unit commitment and generator scheduling, voltage and VAR control, and energy conservation.
57	**EE559: Energy efficiency** 3
	This course introduces the technologies and applications used to increase electrical energy efficiency. It also contains the different types of cables, lines, and lighting systems. This course includes an overview on the Saudi Building Code. Losses in transformers and electric motors will be detailed in this course. This course also contains the technologies of distributed energy resources and microgrids concept. Power quality will be treated, and reactive power compensation methods will be analyzed.

58	**EE509: Computer Applications in Electrical Systems**	3
	This course introduces the utilization of MATLAB Programming Language for analysis of electrical systems such as mathematical methods for solving linear and nonlinear equations, power system matrices formation, and load flow problem solution	
59	**EE542: Advanced Control Systems**	3
	The course provides students with the basic principles of deriving equivalent differential equations for mechanical, electrical, and electromechanical systems (Electrical Machines), state-space models, controllability, observability, and transfer functions. Besides, many feedback control syntheses are addressed namely the pole placement control, the state observer-based feedback control, and the optimal control. The stability analysis is also carried out in the Lyapunov framework. Nevertheless, the digital control synthesis, the stability analysis in the Z-plane, and the closed-loop control are provided in the last part of the course.	
60	**EE403: Introduction to Artificial Intelligence**	3
	This course provides students with fundamental concepts and techniques of intelligent systems. Topics include knowledge representation and interpretation, search strategies and control, active research and applications in intelligent agents and expert systems.	
61	**EE581: Digital Image Processing**	3
	The Digital Image Processing course covers the fundamental concepts and techniques in the field of image processing, quantitative models of imaging systems, spatial domain and frequency domain methods, digital filter design for image enhancement and restoration, edge detection, image denoising, image segmentation, image enhancement, image restoration, image compression, and image representation and description. Students will learn to apply these techniques to various applications in digital image processing.	
62	**EE575: Optical Communications**	3
	The Optical Communications course provides a comprehensive understanding of the principles and techniques of optical communication systems, including optical filters, power couplers/splitters, isolators, circulators, multiplexers, AWGs, Bragg gratings, single and multimode fibers, absorption, attenuation, dispersion, polarization, birefringence, lasers, LEDs, photodetectors, modulators, optical amplifiers, wavelength division multiplexers/de multiplexers, optical switches, electro-optical switches, optical routers, and optical dispersion compensators. Students will explore fiber optic single and multi-wavelength design and various topologies, such as point-to-point, ring, mesh, tree, and bus. The course also introduces free space optical communication, FTTH, access, metropolitan, long-haul, and undersea networks, and covers optical test and measurement instruments. Upon completion of the course, students will be able to design, analyze, and evaluate optical communication systems and networks.	
63	**EE507: Applications of AI and Machine Learning in Electrical Engineering**	3
	This course introduces artificial intelligence (AI) and machine learning (ML) concepts, with a focus on their applications in various areas of electrical engineering, including power systems, control systems, communication systems, signal processing, and electronics. Also, it covers various AI and ML techniques, such as supervised learning, unsupervised learning, reinforcement learning, neural networks, and deep learning, and their practical implementation in solving real-world problems in the electrical engineering domain.	
64	**EE537: Electronic Warfare Principles**	3
	The Electronic Warfare Principles course provides an in-depth study of electronic warfare (EW) concepts, techniques, and systems. It covers topics such as EW	

	taxonomy, electronic support measures (ESM), radar and electronic countermeasures (ECM), electronic counter countermeasures (ECCM), signal intelligence, command, control, and communications (C3) systems, air defense systems, EW simulators, and future trends in EW technology. Students will learn to analyze and evaluate various EW systems and their applications in real-world scenarios.	
65	**EE578: Fundamental of Wireless Communication**	3
	The Fundamentals of Wireless Communications course provides an in-depth study of the key concepts and techniques of wireless communication systems, including personal communication systems (PCS), cellular networks, wireless networks, call processing, frequency reuse, propagation loss, CDMA systems, fade reduction methods, error correction techniques, and multipath. Students will explore multiple access techniques such as FDMA, TDMA, and CDMA, and will use computer simulations to analyze different modulation techniques. The course also covers current and upcoming wireless standards, including 3G, 4G, LTE, 5G, and beyond. Upon completion of the course, students will be able to understand the design, specifications, and performance of various wireless communication systems.	
66	**EE582: Introduction to Radar Systems**	3
	This course provides an introduction to the fundamentals of radar systems, covering essential concepts, principles, and applications. Students will learn about various radar types, including pulse and continuous wave (CW) radars, their characteristics, and operational principles. Also, it covers radar system components, signal processing techniques, detection theory, target tracking, radar performance analysis, and target cross-section. The course also addresses receiver noise and losses, matched filters, pulse compression, target parameter estimation, clutter, and interferences.	
67	**EE577: Information Theory and Coding**	3
	This course introduces the fundamental concepts of information theory and coding, with a focus on understanding the difference between data and information, analyzing the information content of messages, designing efficient source compression codes, and applying error control codes for reliable communication. Students will also learn the basic theory needed for data encryption.	
	C-College Courses	Credits
68	**EE200: Introduction to Computer Programming**	2
	This course introduces basic computer programming concepts using the C++ language. From variables and data types to control structure and functions, students will learn how to transform ideas into code and solve problems.	
69	**CE201: Computer Aided Drawing**	2
	This course represents an introductory to engineering drawings. Computer-aided drawings (CAD) is utilized to produce 2-D engineering drawings. The course is divided into two sections: AutoCAD and drawing. The course begins by teaching the main basics and features of AutoCAD software. Then AutoCAD is used to create pictorial projections, section views, auxiliary views, and dimensioning.	
70	**MATH101: Calculus I**	4
	This course is considered as a first course in differential calculus, dealing mainly with differentiations of elementary functions and their applications.	
71	**MATH202: Calculus II**	4
	This course is mainly dealing with integral calculus, including the following topics: Inverse functions, inverse trigonometric and hyperbolic functions and their derivatives, L'Hôpital's rule, The indefinite integral, methods of integration (substitutions, parts, trigonometric substitutions, partial fractions ...). The definite integral, the fundamental theorem of calculus. Applications of definite integral (Area	

	between two curves, volumes, length of a plane curve, area of a surface of revolution ...).
72	**PHYS101: General Physics 1** 4
	The course is interested in the study of units and dimensions, vectors and their properties, motion in different dimensions and projectile motion. Newton's laws with examples involving friction force or without friction force. The study of kinetic and potential energy conservation and the calculation of work and power. Elastic and inelastic collision and the difference between them. The study rigid body rotation. Lab Experiments: Simple pendulum, Verification of Newton's 2nd law, Static and kinetic friction, Projectile motion, Hook's law, Free fall, Force balance table, Rotational motion, collision
73	**MATH222: Linear Algebra** 3
	The course typically begins with an introduction to vectors and vector spaces, including concepts such as linear independence, basis, and dimension. Then, students learn about linear transformations and matrices, including topics such as matrix multiplication, inverses, and determinants.
74	**MATH241: Differential Equations 1** 3
	The topics covered include ordinary differential equations and some methods to solve them.
75	**CHEM101: General Chemistry I** 4
	Introduction to the general principles of chemistry for students planning a professional career in chemistry, a related science, the health professions, or engineering. The SI units, the chemical formula, Naming covalent and ionic compounds, Stoichiometry, Atomic structure, Electron configuration, Periodic table, Chemical bonding, Gases, Chemical equilibrium, Acids and Bases, Organic chemistry, and Biochemistry chemistry. Weekly laboratory experiments aiming at the safety rules in chemistry lab. and identify the main inorganic acidic and basic radicals based on specific qualitative tests. Weekly discussion sessions focus on homework assignments and lecture material.