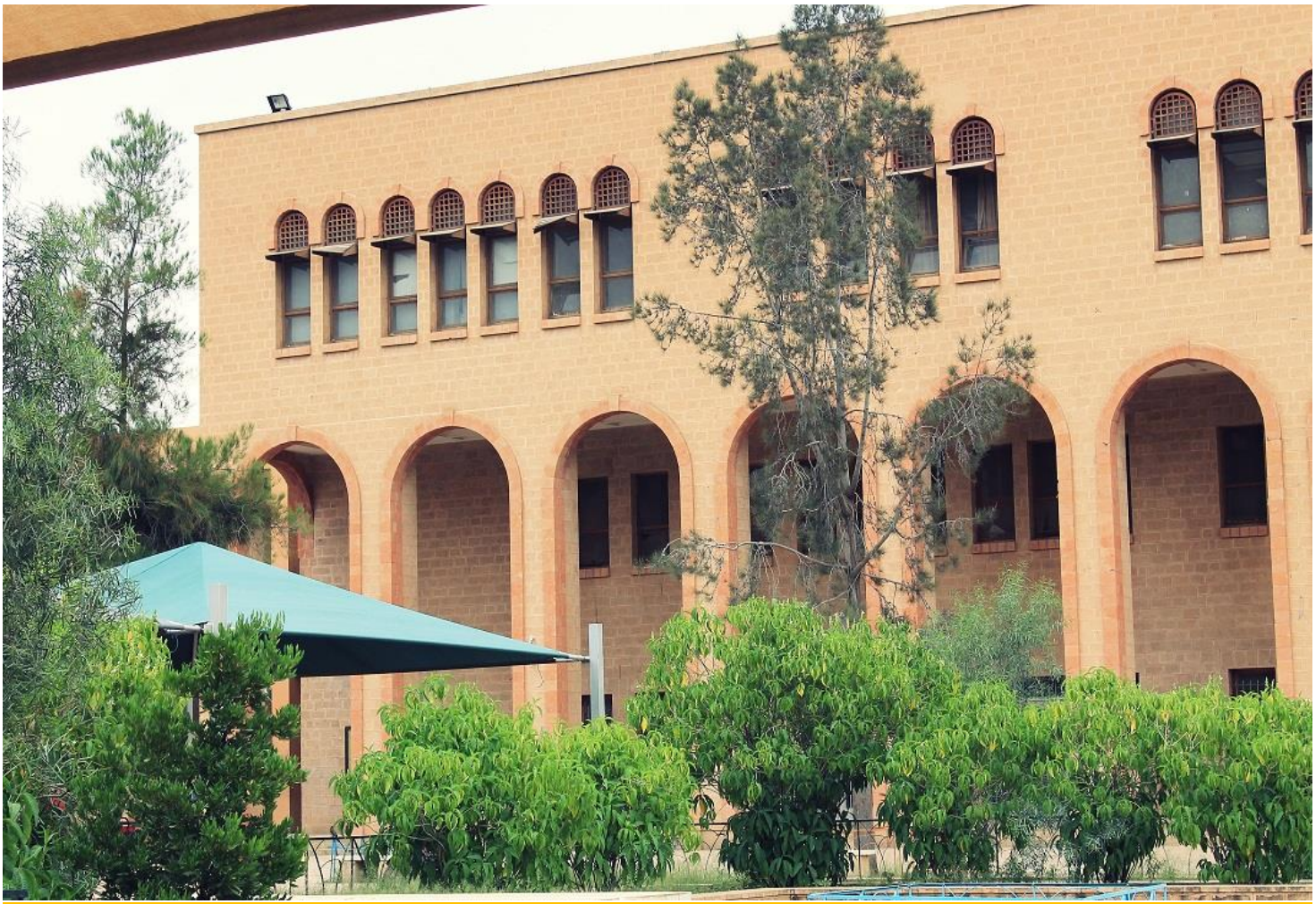
# Electrical Power Engineering Program

## STUDY PLAN 2021



# Sana'a University

# Faculty of Engineering

# Electrical Engineering Department

# Electrical Power and Machines Engineering

# Program Specifications

**Faculty of Engineering, Sana'a University**

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# Electrical Power and Machines Engineering Program Specifications

| Program Identification and General Information: | |
|---|---|
| Program Title | **Electrical Power and Machines Engineering** |
| Host Element | **Sana'a University** |
| Responsible Department | **Electrical Engineering Department** |
| Other Departments with major Teaching Contributions | **Mechanical Engineering Department, Mechatronics Engineering Department** |
| Media of Instruction | **English Language** |
| Mode of Delivery | **Semesters** |
| Total credit hours needed for completion of the program | **176** |
| Length full time | Five academic years (two terms each - full time) |
| Award granted on completion of the Program | Bachelor of Science in Electrical Power and Machines Engineering |
| Location(s) where the program is offered | Inside the University (Eng. Faculty) |
| Approval date: | **October 2020** |

## Vision, Mission & Aims of the Department

### Vision

Sustain the leadership locally and be excellence regionally in education and scientific research in the different fields of electrical Engineering.

### Mission

Graduate qualified Engineers in Electric Power, communication and computer engineering in accordance with programs committed to the international quality standards. The Graduating Engineers handed with enough knowledge and skills necessary to meet the requirements of development as well as local and regional labor markets. Also, they able to self-development and proceed with contemporary issues. The department contribute to community wellness and the country development through scientific research, advisory services, and training and education programs.

### Aims of the Department

1. Graduate high qualified engineers in electrical power, communication and computer engineering able to compete at national and regional levels.
2. Update undergraduate and post graduate programs and enhance the applied research environment to contribute in country development.
3. Establish partnerships with the public and private sectors and provide engineering consultancies, continuous training, teaching and awareness programs.
4. Improve the academic staff to student ratio as per standard.
5. Fill the gap in the number of assistance staff and laboratory technicians and implement training programs to enhance their skills.
6. Commit and uphold high ethical and professional conduct in the education and practice of engineering.

## Program Mission

Power Engineering and Electrical Machines program mission is to prepare high qualified graduates in electrical power and machines engineering able to apply engineering principles to solve a wide range of problems in the field of electrical power engineering. In addition, the program is committed to provide continuing education, outreach activities, consulting and research.

## Program Aims

1. Work professionally and manage skill fully electrical power industries, including generation, transmission, distribution, electrical machines and drives.
2. Implement knowledge in science, mathematics and computational technology to investigate and solve problems encountered in the electrical power industry.
3. Compete at national and regional levels.

4. Conduct effectively and ethically both as a member of or a leadership of a team in multicultural work atmosphere.
5. Follow lifelong learning and continuously improve their knowledge in the electrical power engineering practice and make contributions to the advance of engineering profession.
6. Realize the impact electrical power industry on the environment.

## Graduate Attributes:

**In addition to the practical and professional skills of electrical engineering, the graduates of Electrical Power and Machines Engineering program should be able to:**

1. Design and manage the construction of power generation and distribution systems.
2. Plan and develop the control and protection of power systems and electrical machines.
3. Evaluate and test the electrical machine performance with its power electronics drive devices.
4. Analyze the load demand and determine the appropriate electric type system for it.

## Program Intended Learning Outcomes (PILOs):

### A. Knowledge and Understanding:

**Upon successful completion of an undergraduate Electrical Power and Machines Engineering, the graduates will be able to:**

A1: Demonstrate an understanding of related knowledge in mathematics and science related to Power Engineering and Electrical Machines.

A2: Understand principles of design including elements, processes and/or systems related to Power Engineering and Electrical Machines.

A3: Acquire knowledge of contemporary issues.

A4: Understand professional and ethical responsibilities.

### B. Intellectual/ Cognitive Skills

Upon successful completion of an undergraduate Electrical Power and Machines Engineering, the graduates will be able to**:**

B1: Identify, formulate and solve engineering problems related to Power Engineering and Electrical Machines.

B2: Analyze, interpret and evaluate data.

B3: Analyze electrical engineering systems and processes using appropriate software and techniques.

| |
|---|
| B4: Consider economic, social and environmental dimensions in engineering design related to Power Engineering and Electrical Machines. |
| **C. Professional and Practical Skills**<br>Upon successful completion of an undergraduate Electrical Power and Machines Engineering, the graduates will be able to: |
| C1: Apply acquired knowledge in mathematics and science in solving engineering problems related to Power Engineering and Electrical Machines. |
| C2: Design, model and simulate electrical systems to meet desired needs within realistic constrains. |
| C3: Conduct tests related to electrical engineering practice and interpret data. |
| C4: Use modern engineering techniques, skills and computing tools related to Power Engineering and Electrical Machines. |
| **D. General / Transferable Skills**<br>Upon successful completion of an undergraduate Electrical Power and Machines Engineering, the graduates will be able to: |
| D1: Work effectively within teams. |
| D2: Engage in independent lifelong learning. |
| D3: Adopt professional and ethical responsibilities. |
| D4. Communicate effectively both orally and in written forms. |
| D5. Conduct searches of literature |
| D6. Conduct searches of literature and use databases and other sources of information. |

| **System of Study** | |
|---|---|
| **Terms of study.**<br>Specify the structure of the academic year of study in the program, does it follow a year or semester, Total Credit hours), mode of delivery etc., | Semester System<br>176 Hours |
| **Study Credit.**<br>Specify the program structure and the distribution of Credit and average for each component of the program. Therefore, the program structure should specify:<br>Total number of hours; core requirements; elective requirements, particularly any restriction on electives; the minimum and/or maximum credit points of certain elements of the program where applicable; the requirements for activities such as field studies or professional practice, and Specify how to calculate the student GPA, etc. | |
| **Program Requirement** | % |
| • **University Requirements.** | 17 Hours 9.7% |

| | |
|---|---|
| • **Faculty Requirements.** | 14 Hours 8% |
| • **Basic Requirements** | 24 Hours 13.6% |
| • | |

**1.** Admission Requirements:
Specify the criteria as part of the admission process, such as percentage of secondary school, audition, placement tests, or interview.

1- High School Certificate with not less than 80 % passing ratio.
2- Screening test
3- Student number capacity of 100 students per year

**2.** Degree Requirements
**The purpose of this section is to describe how the way in which students progress through the program relates to the development/ achievement of the learning. (Progression Requirements in order to proceed to the next year or to obtain a degree**).

| | |
|---|---|
| Year 1 to year 2: | Total Credit Hours for Year 1 (36 Hours) |
| Year 2 to year 3 | Total Credit Hours for Year 2 (38 Hours) |
| Year 3 to year 4: | Total Credit Hours for Year 3 (38 Hours) |
| Year4 to year 5: | Total Credit Hours for Year 4 (34 Hours) |
| Year5 to obtain Degree | Total Credit Hours for Year 5 (30 Hours) |

The specification of the degree requirements, which a student must fulfill in order to be eligible to graduate. E.g. total number of credit hours; GPA required for graduation,
What awaits him/her if he/she did not achieve the accumulative GPA in semester or year ?.
If a student got an Academy leave, or stop the study in the program for whatever reason, what are the requirements for continuing his/her study in the program again?,
If the current version of the program is different from the previous one, where he/she studied, how you will deal with him/her with regard to the requirements of graduation?,
What are the requirements for graduation from the program for the student transferring from another program, from the same university or from another university? Etc..

**Course Coding Abbreviations:**

**E-stands for Electrical Engineering Department**
**EE-stands for common courses between the programs**
**EPM-stands for Electrical Power and Machine Engineering Program**
**CN-stands for Communication and Network Engineering Program**
**CC-stands for Computer and Control Engineering Program**
**UR-stands for university requirement**
**FR-stands for faculty requirement**
**BR- stands for department requirement**
**ME-stands for courses offered by Mechanical Engineering Department**

**Study Plan 2020**

The structure and content of the program should be consistent with the University's policy Structure and Requirements of the Awarded Bachelor's Degree and related to University policies.

# Study Plan by Requirements:

## University Requirements

| No | Course No. | Course Name | اسم المقرر | CH | L | T | P |
|---|---|---|---|---|---|---|---|
| | | | | س. م | م | ت | ع |
| **1** | UR001 | Arabic Language 1 | لغة عربية1 | 2 | 2 | 0 | 0 |
| **2** | UR002 | English Language 1 | لغة انجليزية 1 | 2 | 2 | 0 | 0 |
| **3** | UR003 | Computer Skills | مهارات حاسوب | 3 | 2 | 0 | 2 |
| **4** | UR004 | Arabic Language 2 | لغة عربية 2 | 2 | 2 | 0 | 0 |
| **5** | UR005 | English Language 2 | لغة انجليزية 2 | 2 | 2 | 0 | 0 |
| **6** | UR006 | Islamic Culture | ثقافة اسلامية | 2 | 2 | 0 | 0 |
| **7** | UR007 | Arabic Israel Conflict | الصراع العربي الاسرائيلي | 2 | 2 | 0 | 0 |
| **8** | UR008 | National Culture | الثقافة الوطنية | 2 | 2 | 0 | 0 |
| **Total** | | | | 17 | 16 | 0 | 2 |

## Faculty Requirements

| No | Course No. | Course Name | اسم المقرر | CH | L | T | P |
|---|---|---|---|---|---|---|---|
| | | | | س .م | م | ت | ع |
| **1** | FR001 | Mathematics 1 | رياضيات 1 | 3 | 2 | 2 | 0 |
| **2** | FR002 | Engineering Physics | فيزياء هندسية | 4 | 2 | 2 | 2 |
| **3** | FR003 | Mathematics 2 | رياضيات 2 | 3 | 2 | 2 | 0 |
| **4** | FR304 | Engineering Project Management | إدارة مشاريع هندسية | 2 | 1 | 2 | 0 |
| **5** | FR305 | Entrepreneurship & Communication Skill | ريادة اعمال ومهارات تواصل | 2 | 1 | 2 | 0 |
| | | | **Total** | 14 | 8 | 10 | 2 |

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## Basic Requirements

| No | Course No. | Course Name | اسم المقرر | CH | L | T | P |
|---|---|---|---|---|---|---|---|
| | | | | س .م | م | ت | ع |
| **1.** | BR002 | Engineering Workshop | ورش هندسية | 3 | 2 | 0 | 2 |
| **2.** | BR003 | Engineering Drawing | رسم هندسي | 3 | 1 | 0 | 4 |
| **3.** | BR007 | Engineering Mechanics | ميكانيكا هندسية | 3 | 2 | 2 | 0 |
| **4.** | BR111 | Scientific English | انجليزي علمي | 2 | 2 | 0 | 0 |
| **5.** | BR112 | Technical Writing | تقارير فنية | 2 | 2 | 0 | 0 |
| **6.** | BR121 | Linear Algebra | جبر خطي | 3 | 2 | 2 | 0 |
| **7.** | BR122 | Differential Equations | معادلات تفاضلية | 3 | 2 | 2 | 0 |
| **8.** | BR223 | Engineering Mathematics | رياضيات هندسية | 3 | 2 | 2 | 0 |
| **9.** | BR232 | Engineering Economy | اقتصاد هندسي | 2 | 0 | 0 | 0 |
| | | | **Total** | 24 | 15 | 8 | 6 |

## Elective Subjects

| No. | Elective No. | Course Name | اسم المقرر | Credit CH | Lec. | Tu. | Pr. | Level/Semester | CODE |
|---|---|---|---|---|---|---|---|---|---|
| **1.** | Elective 1 | Artificial Intelligence | الذكاء الاصطناعي | 3 | 2 | 2 | 0 | 4th Level/1st Semester | CCE326 |
| | | Illumination | الاضاءة | 3 | 2 | 2 | 0 | | PME344 |
| **2.** | Elective 2 | Planning and Operation of Electrical Power Systems | تخطيط وتشغيل نظم القوى الكهربائية | 3 | 2 | 2 | 0 | 5th Level/1st Semester | PME435 |
| | | Electrical Power Quality | جودة القوى الكهربائية | 3 | 2 | 2 | 0 | | PME447 |
| **3.** | Elective 3 | Communications for Electrical Power Systems | الاتصالات لنظم القوى الكهربائية | 3 | 2 | 2 | 0 | 5th Level/2nd Semester | CNE438 |
| | | Introduction to Robotics | مقدمة في الروبوتات | 3 | 2 | 2 | 0 | | CCE437 |

## Course Plan / First Year

| Year | Semester | Course code | Course Name | اسم المقرر | Credit CH | Lec. | Tu. | Pr. | Pre-Requ. | Co-Requ. |
|---|---|---|---|---|---|---|---|---|---|---|
| First Year | First Semester | BR002 | Engineering Workshop | ورش هندسية | 3 | 2 | 0 | 2 | NA | (blank) |
| | | FR002 | Engineering Physics | فيزياء هندسية | 4 | 2 | 2 | 2 | | (blank) |
| | | FR001 | Mathematics 1 | رياضيات 1 | 3 | 2 | 2 | 0 | | (blank) |
| | | UR001 | Arabic Language 1 | لغة عربية 1 | 2 | 2 | 0 | 0 | | (blank) |
| | | UR002 | English Language 1 | لغة انجليزية 1 | 2 | 2 | 0 | 0 | | (blank) |
| | | UR003 | Computer Skills | مهارات حاسوب | 3 | 2 | 0 | 2 | | (blank) |
| | | UR008 | Arabic Israeli Conflict | الصراع العربي الاسرائيلي | 2 | 2 | 0 | 0 | | (blank) |
| | First Semester Total | | | | 19 | 14 | 4 | 6 | | |
| | | | | | | | | | | |
| | Second Semester | BR003 | Engineering Drawing | الرسم الهندسي | 3 | 1 | 0 | 4 | | (blank) |
| | | BR007 | Engineering Mechanics | ميكانيكا هندسية | 3 | 2 | 2 | 0 | | (blank) |
| | | FR003 | Mathematics 2 | رياضيات 2 | 3 | 2 | 2 | 0 | | (blank) |
| | | UR004 | Arabic Language 2 | لغة عربية 2 | 2 | 2 | 0 | 0 | | (blank) |
| | | UR005 | English Language 2 | لغة انجليزية 2 | 2 | 2 | 0 | 0 | | (blank) |
| | | UR006 | Islamic Culture | ثقافة إسلامية | 2 | 2 | 0 | 0 | NA | (blank) |
| | | UR008 | National Culture | الثقافة الوطنية | 2 | 2 | 0 | 0 | | (blank) |
| | Second Semester Total | | | | 17 | 13 | 4 | 4 | | |
| | | | | First Year Total | 36 | 27 | 8 | 10 | | |

## Course Plan / Second Year

| Year | Semester | Course code | Course Name | اسم المقرر | Credit CH | Lec. | Tu. | Pr. | Pre-Requ. | Co-Requ. |
|---|---|---|---|---|---|---|---|---|---|---|
| Second Year | First Semester | BR111 | Scientific English | انجليزي علمي | 2 | 2 | 0 | 0 | | |
| | | BR121 | Linear Algebra | جبر خطي | 3 | 2 | 2 | 0 | | |
| | | PME111 | Electrical Circuits 1 | دوائر كهربائية 1 | 4 | 2 | 2 | 2 | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | CCE141 | Programming Language 1 (Python) | لغة برمجة 1 (بايثون) | 3 | 2 | 0 | 2 | | |
| | | CCE118 | Logic Circuits | دوائر منطقية | 3 | 2 | 0 | 2 | | |
| | | ME150 | Thermodynamics | ديناميكا حرارية | 3 | 2 | 2 | 0 | | |
| | First Semester Total | | | | 18 | 12 | 6 | 6 | | |
| | | | | | | | | | | |
| | Second Semester | BR112 | Technical Report Writing | كتابة تقارير فنية | 2 | 2 | 0 | 0 | | |
| | | BR122 | Differential Equations | معادلات تفاضلية | 3 | 2 | 2 | 0 | | |
| | | PME112 | Electrical Circuits 2 | دوائر كهربائية 2 | 4 | 2 | 2 | 2 | | |
| | | PME113 | Electronics 1 | الكترونيات 1 | 4 | 2 | 2 | 2 | | |
| | | CCE143 | Programming Language 2 (C/C++) | لغة برمجة 2 (سي/سي++) | 3 | 2 | 0 | 2 | | |
| | | CNE113 | Fields Theory | نظرية مجالات | 3 | 2 | 2 | 0 | | |
| | Second Semester Total | | | | 19 | 12 | 8 | 6 | | |
| | | | | Second Year Total | 37 | 24 | 14 | 12 | Second Year Total | |

## Course Plan / Third Year

| Year | Semester | Course Code | Course Name | اسم المقرر | Credit CH | Lec. | Tu. | Pr. | Pre-Requ. | Co-Requ. |
|---|---|---|---|---|---|---|---|---|---|---|
| Third | | BR223 | Engineering Mathematics | رياضيات هندسية | 3 | 2 | 2 | 0 | | |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | First Semester | CNE214 | Signals and Systems | إشارات ونظم | 3 | 2 | 0 | 2 | | |
| | | PME214 | Electronics 2 | الكترونيات 2 | 4 | 2 | 2 | 2 | | |
| | | PME221 | Electrical Machines 1 | الات كهربائية 1 | 4 | 2 | 2 | 2 | | |
| | | PME241 | Electrical Installation | التمديدات الكهربائية | 3 | 2 | 0 | 2 | | |
| | | BR232 | Engineering Economy | اقتصاد هندسي | 2 | 2 | 0 | 0 | | |
| | First Semester Total | | | | 19 | 12 | 6 | 8 | | |
| | | | | | | | | | | |
| | | PME222 | Renewable Energy Technology | تقنيات الطاقة المتجددة | 3 | 2 | 2 | 0 | | |
| | Second Semester | PME223 | Electrical Measurements and Instrumentations | القياسات الكهربائية وتجهيزاتها | 4 | 2 | 2 | 2 | | |
| | | PME224 | Electrical Machines 2 | الات كهربائية 2 | 4 | 2 | 2 | 2 | | |
| | | PME231 | Power Transmission Systems | نظم نقل الطاقة | 3 | 2 | 2 | 0 | | |
| | | PME244 | Power Electronics | الكترونيات قوى | 4 | 2 | 2 | 2 | | |
| | Second Semester Total | | | | 18 | 10 | 10 | 6 | | |
| | Third Year Total | | | | 37 | 22 | 16 | 14 | Third Year Total | |

# Course Plan / Fourth Year

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| Year | Semester | Course code | Course Name | اسم المقرر | Credit CH | Lec. | Tu. | Pr. | Pre-Requ. | Co-Req. |
|---|---|---|---|---|---|---|---|---|---|---|
| Fourth Year | First Semester | CCE334 | Embedded Systems | أنظمة مدمجة | 3 | 2 | 0 | 2 | | |
| | | PME326 | Special Machines | الات خاصة | 4 | 2 | 2 | 2 | | |
| | | CCE331 | Analog Control Systems | نظم التحكم التماثلي | 4 | 2 | 2 | 2 | | |
| | | PME343 | Power Generation Plants | محطات توليد كهربائية | 3 | 2 | 2 | 0 | | |
| | | XXE3XX | Elective Course 1 | مقرر اختياري 1 | 3 | 2 | 2 | 0 | | |
| | | PME345 | Industrial Safety | الامان الصناعي | 3 | 2 | 2 | 0 | | |
| | First Semester Total | | | | 20 | 12 | 10 | 6 | First Total | |
| | Second Semester | CCE332 | Digital Control Systems | نظم التحكم الرقمي | 3 | 2 | 2 | 0 | | |
| | | PME346 | Industrial Automation | التحكم الصناعي | 3 | 2 | 0 | 2 | | |
| | | FR304 | Engineering Project Management | إدارة مشاريع هندسية | 2 | 1 | 2 | 0 | | |
| | | FR305 | Entrepreneurship &Communication Skills | ريادة أعمال ومهارات اتصال | 2 | 2 | 0 | 0 | | |
| | | PME327 | Electrical Drives | محركات كهربائية | 4 | 2 | 2 | 2 | | |
| | | PME332 | Power System Analysis 1 | تحليل نظم قوى 1 | 3 | 2 | 2 | 0 | | |
| | Second Semester Total | | | | 17 | 11 | 8 | 4 | | |
| | Fourth Year Total | | | | 37 | 23 | 18 | 10 | Fourth Year Total | |

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## Course Plan / Fifth Year

| Year | Semester | Course Code | Course Name | اسم المقرر | Credit CH | Lec. | Tu. | Pr. | Pre-Requ. | Co-Requ. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PME333 | Power System Analysis 2 | تحليل نظم قوى 2 | 3 | 2 | 2 | 0 | | |
| | | PME415 | Graduate Project 1 | مشروع التخرج 1 | 2 | 2 | 0 | 0 | | |
| | | PME446 | High Voltage Engineering | جهد عالي | 3 | 2 | 2 | 0 | | |
| | | PME428 | Substation Design | تصميم محطات التحويل | 3 | 2 | 2 | 0 | | |
| | | PME434 | Power Distribution Systems | نظم توزيع الطاقة | 3 | 2 | 2 | 0 | | |
| | | PME4XX | Elective Course 2 | (مقرر اختياري 2) | 3 | 2 | 2 | 0 | | |
| | First Semester Total | | | | 17 | 12 | 10 | 0 | First Total | |
| | | | | | | | | | | |
| | Second Semester | PME416 | Industrial Training | تدريب صناعي | 3 | 1 | 0 | 4 | | |
| | | PME415 | Graduate Project 2 | مشروع التخرج 2 | 3 | 2 | 2 | 0 | | |
| | | PME436 | Power System Protection | وقاية أنظمة القوى | 4 | 2 | 2 | 2 | | |
| | | XXE4XX | (Elective Course 3) | ا (مقرر اختياري 3) | 3 | 2 | 2 | 0 | | |
| | Second Semester Total | | | | 13 | 7 | 6 | 6 | Second Total | |
| | Fifth Year Total | | | | 30 | 19 | 16 | 6 | Fifth Year Total | |
| **Program Total CH** | | | | | 177 | 115 | 72 | 52 | Grand Total | |

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