



**School of Engineering Technology**  
**Electrical Engineering Department**

**Bachelor Degree in Electrical Engineering**  
**Study Plan**

**2020**

## **Program Objectives**

1. Provide world-class, flexible, STEM-based education which combines in-depth technical knowledge with professional, leadership, and entrepreneurial skills.
2. Build advanced practical and technical skills to enable the student to conceive, design, build, and test complex engineering systems.
3. Provide the student with a hands-on understanding of the evolving market needs through a tailored and intensive industry-based apprenticeship scheme.
4. Create opportunities to enhance the student's character, soft skills and adaptation abilities within different multidisciplinary teams and various professional environments.
5. Emphasize the necessity of engaging in life-long independent learning and professional development.
6. Equip the student with the relevant up-to-date skills for employment in a variety of technical and engineering fields, or initiating an innovative entrepreneurial venture or a technology startup.
7. Enable the student to progress in graduate studies in relevant technical or engineering fields.

## **Learning Outcomes**

Upon graduation, the graduate of the Electrical Engineering Program should be able to:

1. Apply the knowledge of science, mathematics, technology, and engineering fundamentals to electrical engineering applications.
2. Design and conduct experiments, as well as analyze and present results in a professional manner.
3. Design, model, analyze and build practical electrical systems to meet specific requirements and realistic constraints.
4. Use the techniques, skills and modern engineering and computing tools necessary for engineering practices.
5. Identify, formulate and solve engineering problems.
6. Communicate effectively and function in multidisciplinary teams.

7. Understand professional and ethical issues and the responsibilities of the engineering practice.
8. Recognize contemporary issues and environmental, cultural, and economical considerations of the engineering profession.
9. Appreciate the need for professional development and engage in life-long learning.
10. Engage in entrepreneurial activity and understand the value of technology innovation.
11. Understand the requirements and constraints of the professional employment environment.

## **Assessment of Learning Outcomes**

Assessment model requires the students to engage with a variety of assessment tools including design and practical projects, laboratory activities and simulations, take-home assignments and conventional in-class examinations. The assessment tools are designed to support the development of the students' knowledge, deep understanding, self-efficacy and confidence. Examinations are required to be based on practical scenarios to maintain the connection between the theoretical and experimental parts of knowledge delivered through the courses. A robust quality assurance system relying on systematic internal-verification procedures is used, monitoring the assignments in terms of content and grading, ensuring that the best implementation is adopted. Feedback to the students is given in the form of formative and summative feedback. Formative support is continuously provided to the students throughout the course, leading them constructively towards enhancing their understanding and skills, based on their performance that is measured by various assessment tools.

# Framework for Bachelor Degree

Classification	Credit Hours		
	Compulsory	Elective	Total
University Requirements	24	3	27
School Requirements	32	0	32
Program Requirements	77	12	89
Professional Apprenticeship Training	18	0	18
<b>Total</b>	<b>151</b>	<b>15</b>	<b>166</b>

## 1. University Requirements: (27 credit hours)

### 1.1. English Language Prerequisites:

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
			Lecture	Practical	
30301120	Pre-Foundation English Elementary Intensive	0	6	3	Placement Test 0-29

### 1.2. Compulsory: (24 credit hours)

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
			Lecture	Practical	
<b>English Path 1</b>					
30301121	English Pre-Intermediate Intensive	4	6	3	30301120 or Placement Test 30-42
30301123	English Intermediate	3	6	0	30301121
30301124	English Upper-Intermediate	3	6	0	Placement Test 59-66 or 30301122 or 30301123
30301125	English Advanced	3	6	0	Placement Test 67-75 or 30301124
<b>English Path 2</b>					
30301122	English Intermediate Intensive	4	6	3	Placement Test 43-58
30301124	English Upper-Intermediate	3	6	0	Placement Test 59-66 or 30301122 or 30301123
30301125	English Advanced	3	6	0	Placement Test 67-75 or 30301124
<b>Non-English Courses</b>					
30302111	Soft Skills I	2	3	0	-
30302112	Soft Skills II	2	3	0	30302111
30302231	Entrepreneurship Boot camp	6	12	0	-
30302232	Leadership Camp*	1	0	3	30302231
<b>Total</b>		<b>24</b>			

\* This course includes 10-days intensive training boot camp held off-campus.

### 1.3. Elective: (3 Credit Hours) (three courses out of the following)

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
			Lecture	Practical	
30301130	Foundational French Language	1	3	0	-
30301131	French Language Level 1	1	3	0	30301130
30301232	French Language Level 2	1	3	0	30301131
30301233	French Language Level 3	1	3	0	30301232
30302133	Principles of Management	1	3	0	-
30302134	Strategies for Industry Competitiveness: Tools & Techniques	1	3	0	-
30302121	Science & Society Seminar I: Arab Contributions to Science and Arts	1	1	0	-
30302122	Science & Society Seminar II: Philosophy of Science	1	1	0	-
30302123	Art Appreciation and Techniques	1	1	0	-
30302124	Civil and Professional Culture	1	1	0	-
30302125	Rights and Responsibilities: Understanding Human Rights	1	1	0	-
<b>Total</b>		<b>3</b>			

### 2. School Requirements: (32 credit hours)

Course ID	Course Title	Credit Hours	Contact Hours		Type	Prerequisite
			Lecture	Practical		
30303111	Functional Math	3	3	0	HTU	Placement Test
30303112	Functional Physics	3	3	0	HTU	-
30201100	Fundamentals of Computing	4	3	3	HTU	-
00101100	Introduction to Engineering Drawing	1	0	3	HTU	-
00103101	STEM Lab I	1	0	3	HTU	-
00102102	STEM Lab II	1	0	3	HTU	00103101
00101103	Workshop I	2	0	6	HTU	-
00101104	Workshop II	1	0	3	HTU	00101103
00103110	Engineering Math	4	3	3	HNC	30303111
00102111	Engineering Science	4	3	3	HNC	30303112
00101112	Engineering Design	4	3	3	HNC	00101100
00102220	Managing a Professional Engineering Project	4	3	3	HNC	00101112
<b>Total</b>		<b>32</b>				

### 3. Program Requirements (89 credit hours)

#### 3.1. Compulsory: (77 credit hours)

Course ID	Course Title	Credit Hours	Contact Hours		Type	Prerequisite
			Lecture	Practical		
00103205	Advanced Workshop for Electrical Engineers	1	0	3	HTU	00101104
00103230	Electrical and Electronic Principles	4	3	3	HNC	00102111
00103280	Digital Principles	4	3	3	HNC	30201100
00103240	Electronic Circuits and Devices	4	3	3	HNC	00103230
00103250	Instrumentation and Control Systems	4	3	3	HNC	00103230
00103260	Signals and Systems	3	3	0	HTU	00103280, 00103213
00103341	Analog Electronic Systems	3	2	3	HTU	00103240
00103213	Further Mathematics	4	3	3	HND	00103110
00102321	Professional Engineering Management	4	3	3	HND	001202220
00103331	Industrial Power, Electronics and Storage	4	3	3	HND	00103240
00103351	Industrial Systems	4	3	3	HND	00103250, 00103280
00103232	Further Electrical, Electronic and Digital Principles	4	3	3	HND	00103230, 00103213
00103352	Further Control Systems	4	3	3	HND	00103250, 00103213
00103490	Research Project for Electrical Engineers	4	2	6	HND	Department Approval
00103361	Introduction to Electromagnetics	3	3	0	HTU	00103230, 00103213
00103362	Communication Systems I	3	2	3	HTU	00103260
00103333	Electrical Machines	3	2	3	HTU	00103232
00103534	Power Systems	3	2	3	HTU	00103232
00103535	Power System Quality, Reliability and Protection	3	3	0	HTU	00133534
00102541	Photovoltaic Systems	3	2	3	HTU	00103232
00103542	Digital Electronic Systems	2	1	3	HTU	00103341
00103563	Communication Systems II	3	3	0	HTU	00103362
00103591	Capstone Project for Electrical Engineers	3	1	6	HTU	Department Approval
<b>Total</b>		<b>77</b>				

### 3.2. Electives: (12 credit hours) (Four courses out of the following)

A minimum of 12 credit hours of engineering coursework are required. This list is considered to be open for modifications on the base of the decision of the school council before registration.

Course ID	Course Title	Credit Hours	Contact Hours		Type	Prerequisite
			Lecture	Practical		
00103536	Advanced Electrical Machines	3	3	0	HTU	00103333
00103537	Special Topics in Power Systems	3	3	0	HTU	00103534
00103538	Electrical Drive Systems	3	3	0	HTU	00103333, 00103341
00102544	Green Buildings	3	2	3	HTU	00102111
00103543	Nano-Electronics and Information Technology	3	3	0	HTU	00103260, 00103542
00103544	Optical Electronics and Applications	3	3	0	HTU	00103362, 00103341
00103545	Special Topics in Clinical Engineering	3	3	0	HTU	00103341
00103564	Network Science	3	2	3	HTU	00103563
00103565	Special Topics in Communications	3	3	0	HTU	00103362
00103570	Data Structures and Algorithms	3	2	3	HTU	30201100
00103571	Data Analytics	3	3	0	HTU	00103213
00103572	Artificial Intelligence and Engineering Applications	3	3	0	HTU	00103570, 00103571
00103573	Machine Learning	3	3	0	HTU	00103570, 00103571
00103581	Embedded Systems	3	2	3	HTU	00103341
<b>Total</b>		<b>12</b>				

### 4. Professional Apprentices Requirements (18 credit hours) (8 months)

Course ID	Course Title	Credit Hours	Contact Hours		Type	Prerequisite
			Lecture	Practical		
00103492	Practical Training for Electrical Engineers	18	0	40	HTU	Department Approval
<b>Total</b>		<b>18</b>				

# Study Plan Guide for the Bachelor Degree in Electrical Engineering

<b>First Year</b>			
<b>First Semester</b>			
<b>Course ID</b>	<b>Course Title</b>	<b>Cr. Hr.</b>	<b>Prerequisites</b>
30301121	English Pre-Intermediate Intensive	4	Placement Test 30-42 or 30301120
30301122	English Intermediate Intensive		Placement Test 43-58
30201100	Fundamentals of Computing	4	-
30303111	Functional Math	3	Placement Test
30303112	Functional Physics	3	-
00101103	Workshop I	2	-
00101100	Introduction to Engineering Drawing	1	-
00103101	STEM Lab I	1	-
<b>Total</b>		<b>18</b>	

<b>First Year</b>			
<b>Second Semester</b>			
<b>Course ID</b>	<b>Course Title</b>	<b>Cr. Hr.</b>	<b>Prerequisites</b>
00103110	Engineering Math	4	30303111
00102111	Engineering Science	4	30303112
00101112	Engineering Design	4	00101100
30301123	English Intermediate	3	30301121
30302111	Soft Skills I	2	-
00102102	STEM Lab II	1	00103101
00101104	Workshop II	1	00101103
<b>Total</b>		<b>19</b>	



Second Year			
First Semester			
Course ID	Course Title	Cr. Hr.	Prerequisites
00103230	Electrical and Electronic Principles	4	00102111
001030213	Further Mathematics	4	00103110
00103280	Digital Principles	4	30201100
30301124	English Upper-Intermediate	3	Placement Test 59-66 or 30301122 or 30301123
30302112	Soft Skills II	2	30302111
00103205	Advanced Workshop for Electrical Engineers	1	00101104
-	University Elective	1	-
<b>Total</b>		<b>19</b>	

Second Year			
Second Semester			
Course ID	Course Title	Cr. Hr.	Prerequisites
00103240	Electronic Circuits and Devices	4	00103230
00103250	Instrumentation and Control Systems	4	00103230
00102220	Managing a Professional Engineering Project	4	00101112
00103232	Further Electrical, Electronic and Digital Principles	4	00103230, 00103213
00103260	Signals and Systems	3	00103280, 00103213
<b>Total</b>		<b>19</b>	

<b>Third Year</b>			
<b>First Semester</b>			
<b>Course ID</b>	<b>Course Title</b>	<b>Cr. Hr.</b>	<b>Prerequisites</b>
00103352	Further Control Systems	4	00103250, 00103213
00103331	Industrial Power, Electronics and Storage	4	00103240
00102321	Professional Engineering Management	4	00102220
00103362	Communication Systems I	3	00103260
30301125	English Advanced	3	Placement Test 67-75 or 30301124
-	University Elective	1	-
<b>Total</b>		<b>19</b>	

<b>Third Year</b>			
<b>Second Semester</b>			
<b>Course ID</b>	<b>Course Title</b>	<b>Cr. Hr.</b>	<b>Prerequisites</b>
30302231	Entrepreneurship Bootcamp	6	-
00103351	Industrial Systems	4	00103250, 00103280
00103341	Analog Electronic Systems	3	00103240
00103333	Electrical Machines	3	00103232
00103361	Introduction to Electromagnetics	3	00103230, 00103213
<b>Total</b>		<b>19</b>	

<b>Fourth Year</b>			
<b>First &amp; Second Semester</b>			
<b>Course ID</b>	<b>Course Title</b>	<b>Cr. Hr.</b>	<b>Prerequisites</b>
00103492	Practical Training for Electrical Engineers	18	Department Approval
00103490	Research Project for Electrical Engineers	4	Department Approval
<b>Total</b>		<b>22</b>	

<b>Fifth Year</b>			
<b>First Semester</b>			
<b>Course ID</b>	<b>Course Title</b>	<b>Cr. Hr.</b>	<b>Prerequisites</b>
00103534	Power Systems	3	00103232
00102541	Photovoltaic Systems	3	00103232
-	Department Elective	3	-
-	Department Elective	3	-
00103591	Capstone Project for Electrical Engineers	3	Department Approval
00103542	Digital Electronic Systems	2	00103341
<b>Total</b>		<b>17</b>	

<b>Fifth Year</b>			
<b>Second Semester</b>			
<b>Course ID</b>	<b>Course Title</b>	<b>Cr. Hr.</b>	<b>Prerequisites</b>
00103535	Power System Quality, Reliability and Protection	3	00103534
-	Department Elective	3	-
-	Department Elective	3	-
00103563	Communication Systems II	3	00103362
30302232	Leadership Camp	1	30302231
-	University Elective	1	-
<b>Total</b>		<b>14</b>	

## Course Identification Convention

Version (1 <sup>st</sup> Digit)	School (2 <sup>nd</sup> &3 <sup>rd</sup> Digit)	Department (4 <sup>th</sup> &5 <sup>th</sup> Digit)	Level (6 <sup>th</sup> Digit)	Knowledge Group (7 <sup>th</sup> Digit)	Sequence
0	01: Engineering Technology	01: Mechanical Engineering  02: Energy Engineering  03: Electrical Engineering	1: 1 <sup>st</sup> Year  2: 2 <sup>nd</sup> Year  3: 3 <sup>rd</sup> Year  4: 4 <sup>th</sup> Year  5: 5 <sup>th</sup> Year	0: Engineering Skills  1: Engineering Science  2: Engineering Management  3: Power & Energy  4: Electronics  5: Industrial & Control  6: Communications & Networking  7: Data Science  8: Computer  9: Research & Professional Skills	

## Study Plan Knowledge Groups

		Course ID	Course Title
<b>Group 0</b>	Engineering Skills	30201100	Fundamentals of Computing
		00101100	Introduction to Engineering Drawing
		00103101	STEM Lab I
		00102102	STEM Lab II
		00101103	Workshop I
		00101104	Workshop II
		00103205	Advanced Workshop for Electrical Engineers
<b>Group 1</b>	Engineering Science	30303111	Functional Math
		30303112	Functional Physics
		00103110	Engineering Math
		00102111	Engineering Science
		00101112	Engineering Design
		00103213	Further Mathematics

<b>Group 2</b>	Engineering Management	00102220	Managing a Professional Engineering Project
		00102321	Professional Engineering Management
<b>Group 3</b>	Power & Energy	00103230	Electrical and Electronic Principles
		00103331	Industrial Power, Electronics and Storage
		00103232	Further Electrical, Electronic and Digital Principles
		00103333	Electrical Machines
		00103534	Power Systems
		00103535	Power System Quality, Reliability and Protection
		00103536	Advanced Electrical Machines
		00103537	Special Topics in Power Systems
		00103538	Electrical Drive Systems
		00102541	Photovoltaic Systems
00102544	Green Buildings		
<b>Group 4</b>	Electronics	00103240	Electronic Circuits and Devices
		00103341	Analog Electronic Systems
		00103542	Digital Electronic Systems
		00103543	Nano-Electronics and Information Technology
		00103544	Optical Electronics and Applications
		00103545	Special Topics in Clinical Engineering
<b>Group 5</b>	Industrial & Control	00103250	Instrumentation and Control Systems
		00103351	Industrial Systems
		00103352	Further Control Systems
<b>Group 6</b>	Communications & Networking	00103260	Signals and Systems
		00103361	Introduction to Electromagnetics
		00103362	Communication Systems I
		00103563	Communication Systems II
		00103564	Network Science
		00103565	Special Topics in Communications
<b>Group 7</b>	Data Science	00103570	Data Structures and Algorithms
		00103571	Data Analytics
		00103572	Artificial Intelligence and Engineering Applications
		00103573	Machine Learning

<b>Group 8</b>	Computer	00103280	Digital Principles
		00103581	Embedded Systems
<b>Group 9</b>	Research & Professional Skills	00103490	Research Project for Electrical Engineers
		00103591	Capstone Project for Electrical Engineers
		00103492	Practical Training for Electrical Engineers

# Course Descriptions

## **30301121: English Pre-Intermediate Intensive**

**4 Cr (8,3)**

This foundation course deals with all language skills: speaking, listening, reading, writing, grammar review, and vocabulary building. The overall objective of the course is to ensure that students are able to understand and express in speaking and writing information, ideas, feelings, opinions and common functions about everyday situations in straightforward spoken and written English.

By the end of the course, students will reach a B1 level on the Global Scale of English (GSE). Students will be evaluated on their ability to understand the main points of clear standard input on familiar matters regularly encountered in work, school, and leisure. In addition, students are required to be able to deal with most situations likely to arise while traveling in an area where English is spoken. Students will be able to produce simple connected text on topics which are familiar or of personal interest. Finally, students will be able to describe experiences and events, dreams, hopes and ambitions, and briefly give reasons and explanations for opinions and plans. This course also includes a scheduled lab time of three hours per week dedicated to Pearson's My English Lab practice, writing workshops, and projects pertaining to the ENGL 100 syllabus.

*Prerequisites: Placement Test Score 30-42 or 30301120*

## **30301122: English Intermediate Intensive**

**3 Cr (4,3)**

This foundation course deals with all language skills: speaking, listening, reading, writing, grammar review, and vocabulary building. The overall objective of the course is to ensure that students are able to understand and express in speaking and writing information, ideas, feelings, opinions, and common functions about everyday situations in straightforward spoken and written language.

By the end of the course, students will reach a B1+ level on the Global Scale of English (GSE). Students will be evaluated on their ability to understand the main points of clear standard input on familiar matters regularly encountered in work, school, and leisure. In addition, students are required to be able to deal with most situations likely to arise while traveling in an area where English is spoken. Students will be able to produce simple connected text on topics which are familiar or of personal interest. Finally, students will be able to describe experiences and events, dreams, hopes and ambitions, and briefly give reasons and explanations for opinions and plans. This course also includes a scheduled lab time of three hours per week dedicated to Pearson's My English Lab practice, writing workshops, and projects pertaining to the ENGL 110 syllabus.

*Prerequisites: Placement Test Score 43-58*

## **30301123: English Intermediate**

**3 Cr (4,3)**

This course is meant to follow on from ENGL 100 and will align with ENGL 110 although in a less intense form and with less supplementary material. This course deals with all language skills: speaking, listening, reading, writing, grammar review, and vocabulary building. The overall objective of the course is to ensure that students are able to understand and express in speaking and writing information, ideas, feelings,

opinions, and common functions about everyday situations in straightforward spoken and written language.

By the end of the course, students will reach a B1+ level on the Global Scale of English (GSE). Students will be evaluated on their ability to understand the main points of clear standard input on familiar matters regularly encountered in work, school, and leisure. In addition, students are required to be able to deal with most situations likely to arise while traveling in an area where English is spoken. Students will be able to produce simple connected text on topics which are familiar or of personal interest. Finally, students will be able to describe experiences and events, dreams, hopes and ambitions, and briefly give reasons and explanations for opinions and plans.

*Prerequisites: 30301121*

### **30301124: English Upper-Intermediate**

**3 Cr (4,3)**

This course is meant to follow ENGL 110 or ENGL 120. This course deals with all language skills: speaking, listening, reading, writing, grammar review, and vocabulary building. The overall objective of the course is to ensure that students are able to understand and respond appropriately in the spoken and written form to the purpose, information, and points of view in spoken and written communication of the kind required in a variety of study, work, every day, and leisure-related contexts in daily life.

By the end of the course, students will reach a B2 level on the Global Scale of English (GSE). Students will be evaluated on their ability to understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in their field of specialization. In addition, students are required to be able to interact with a degree of fluency and spontaneity that makes regular interaction with native speakers possible without strain for either party. Students will be able to produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.

*Prerequisites: Placement Test 59-66 or 30301122 or 30301123*

### **30301125: English Advanced**

**3 Cr (4,3)**

This course is meant to follow ENGL 130. This course deals with all language skills: speaking, listening, reading, writing, grammar review, and vocabulary building. The overall objective of the course is to ensure that students are able to understand and respond appropriately in the spoken and written form to a wide range of demanding, longer texts and recognize implicit meaning.

By the end of the course, students will reach a C1 level on the Global Scale of English (GSE). Students will be evaluated on their ability to express themselves fluently and spontaneously without much obvious searching for expressions. In addition, students are required to be able to use language flexibly and effectively for social, academic, and professional purposes. Students will be able to produce clear, well-structured, detailed text on complex subjects, showing controlled use of organizational patterns, connectors and cohesive devices.

*Prerequisites: Placement Test 67-75 or 30301124*



**30301130: Foundational French Language****1 Cr (3,0)**

This course aims to enable students to develop competence in a range of predictable everyday tasks in French. In addition to acquiring essential listening and speaking skills, students will also develop and practice basic reading and writing techniques.

*Prerequisites: -*

**30301131: French Language Level 1****1 Cr (3,0)**

This course enables students to improve their communicative competence in French as a supplement to their studies in other disciplines. For students intending to travel to France or French-speaking countries, either for study or on work placements, the course can serve as a refresher and build students' confidence in communicating with native speakers abroad.

*Prerequisites: 30301130*

**30301232: French Language Level 2****1 Cr (3,0)**

This course will strengthen students' reading and writing skills and reinforce communicative skills acquired during previous study of the French language. Students will gain further insight into the culture and civilization of French-speaking countries. The course offers more advanced study of language structure and syntax with a focus on using the target language to discuss and analyze aspects of French and society.

*Prerequisites: 30301131*

**30301233: French Language Level 3****1 Cr (3,0)**

This course aims to enable students to communicate more effectively in French in situations ranging from informal conversations to formal interviews or presentations. Students will be trained to understand extended speech in French (e.g., presentations, news reports, and lectures); read and understand French-language articles and fictional and non-fictional passages; and write essays and draft formal, non-personal emails in French. Students will also develop greater self-awareness of their strengths and weaknesses in order to improve their learning skills.

*Prerequisites: 30301232*

**30302121: Science & Society Seminar I: Arab Contributions to Science and Arts****1 Cr (1,0)**

This seminar-based course highlights Arab contributions to science and arts since the early Mesopotamian and Phoenician civilizations with particular emphasis on contributions during the Middle Ages under Islam.

*Prerequisites: -*

**30302122: Science & Society Seminar II: Philosophy of Science****1 Cr (1,0)**

This course explores the effects of scientific and technological developments on various aspects of society. It is designed to illuminate the distinctive character of science and its relevance to the challenges facing our world, including environmental concerns, public and global policy, international competitiveness, and legal and ethical liabilities.

*Prerequisites: -*

**30302123: Art Appreciation and Techniques****1 Cr (1,0)**

This course affords students a basic understanding of the main elements of art. It covers context and subject and analyzes the main arguments around aesthetics. The course also presents an overview of art history as it relates to other historical, sociocultural, and political aspects. The course aims to prepare students to be critically observant and to assess different symbolic values within artwork. The course is intended to raise students' awareness of the role of the arts and culture in their everyday lives regardless of students' areas of concentration and to promote an appreciation for, and interest in, the arts.

*Prerequisites: -*

**30302124: Civil and Professional Culture****1 Cr (1,0)**

This course aims to consolidate and enhance students' knowledge of their native Jordan, the efforts of the Hashemite Kings in serving the Arab nation, its causes, and the establishment and development of the Jordanian state. It introduces students to the development of Jordanian political and constitutional life as well as to the emergence and development of Jordanian civil society. This course focuses on building students' professionalism and defining the concepts of professional work and ethics. Students will learn about legislation related to professional work as well as trade union institutions, professionalism, and labor.

*Prerequisites: -*

**30302125: Rights and Responsibilities: Understanding Human Rights****1 Cr (1,0)**

This course aims to introduce students to the basic concept of human rights. Students will be expected to understand and internalize human rights values including tolerance; gender equality; and freedom from discrimination based on race, color, and ethnicity. The course aims to contribute to the full development of students' personalities by increasing their sense of dignity and appreciation for the rights of others. Students will also cultivate a sense of responsibility to promote and defend others' rights. Students will develop their advocacy skills by identifying key human rights issues in their local context and proposing courses of action to advance human rights.

*Prerequisites: -*

**30302133: Principles of Management****1 Cr (1,0)**

This course introduces students to the management process of a business organization. The course emphasizes basic concepts and functions of management by examining the processes of planning, organizing, leading, and controlling. Students will develop the skills and tools required to work with people and resources to achieve organizational goals. Students will also develop their strategic management and decision-making capacities.

*Prerequisites: -*

**30302134: Strategies for Industry Competitiveness: Tools & Techniques****1 Cr (1,0)**

This course covers the role of policy in industry competitiveness. The course examines firm strategies, cluster vitality, and the quality of the business environment in which competition takes place, all of which can determine a nation's productivity.

*Prerequisites: -*

**30303111: Functional Math****3 Cr (3,0)**

This course reviews the fundamental concepts in numerical analysis, linear algebra, geometry, statistics, and probabilities. It strengthens problem-formulation skills (i.e., the ability to translate real application problems into a series of mathematical processes). It also focuses on developing the mathematical reasoning skills, such as mathematical deductions and proofs.

*Prerequisites: Placement Test*

**30303112: Functional Physics****3 Cr (3,0)**

This course demonstrates understanding and application of essential physics topics such as: Physics and measurements, motion in one dimension, vectors, motion in two dimensions, the laws of motion, forces and motion, applications of Newton's laws (projectile, angular velocity, etc.), energy of a system, static equilibrium, and electricity and magnetism.

*Prerequisites: -*

**30201100: Fundamentals of Computing****4 Cr (3,3)**

This course provides a comprehensive route to developing an in-depth exposure to personal computers, hardware, a range of operating systems, and in-depth programming in C. Students learn the functionality of various hardware and software components and best practices in maintenance and safety issues as well as programming in C, including variables, operations, functions, structures, and pointers.

*Prerequisites: -*

**00101100: Introduction to Engineering Drawing****1 Cr (0,3)**

This course provides the fundamentals of engineering graphics and drawing. Among the topics covered are: drawing of orthographic, isometric and auxiliary projections, sectioning, dimensioning, scaling and documentation. Students learn and use the interface, structure, and commands of the latest version of a conventional computer-aided design (CAD) software.

*Prerequisites: -*

**00103101: STEM Lab I****1 Cr (0,3)**

This course develops the basic skills in the fields of science, technology, engineering and mathematics through a set of practical experiments covering mechanical, electrical, electronics, automation, mechanics of materials, robotics, computer applications and process control.

*Prerequisites: -*

**00102102: STEM Lab II****1 Cr (0,3)**

This course provides students with a modern hands-on technical perspective of STEM education as they are applied in professional settings. The lab is equipped with state-of-the-art educational technologies in fields related - but not limited - to electromechanical systems, robotics, pneumatic systems, automation, image processing, sensor installation and calibration and material manufacturing processes.

*Prerequisites: 00103101*

**00101103: Workshop I****2 Cr (0,6)**

This course develops the following basic skills: Hand filing, turning, welding, piping and plumbing, carpentry, brick laying, constructional works, surveying measurements, sheet metal fabrication, household electric circuits and installation of simple computer networks.

*Prerequisites: -*

**00101104: Workshop II****1 Cr (0,3)**

This course covers hands-on training on manual and electric driven tools, electric arc welding, spot welding, resistance welding, sand casting, sheet-metal forming, longitudinal lathing, longitudinal and inclined turning and metal milling.

*Prerequisites: 00101103*

**00103110: Engineering Math****4 Cr (3,3)**

This course aims to develop students' skills in the mathematical principles and theories that are directly applicable to the engineering industry. Students will be introduced to mathematical methods and statistical techniques that enable them to analyze and solve problems within an engineering context. Among the topics included in this course are: Arithmetic and geometric progressions (exponential, logarithmic, circular and hyperbolic functions), mean and standard deviation of grouped data, linear regression, binomial and normal distributions. In addition to sine waves and their applications, trigonometric and hyperbolic identities, vector functions and the use of differential and integral calculus in solving engineering problems.

*Prerequisites: 30303111*

**00102111: Engineering Science****4 Cr (3,3)**

This course introduces the fundamental laws and applications of the physical sciences within engineering and the application of this knowledge in finding solutions to a variety of engineering problems. Among the topics included in this course are: international system of units, interpreting data, static and dynamic forces, fluid mechanics and thermodynamics, material properties and failure, in addition to A.C./D.C. circuit theories.

*Prerequisites: 30303112*

**00101112: Engineering Design****4 Cr (3,3)**

This course introduces the methodical steps that engineers use in creating functional products and processes, starting from a design brief to the work and the stages involved in identifying and justifying a solution to a given engineering need. Among the topics included in this course are: Gantt charts and critical path analysis, stakeholder requirements, market analysis, design process management, modelling and prototyping, manufacturability, reliability life-cycle, safety and risk management, calculations, drawings and concepts and ergonomics.

*Prerequisites: 00101100*

**00102220: Managing a Professional Engineering Project****4 Cr (3,3)**

This course introduces students to the techniques and best practices required to successfully create and manage an engineering project designed to identify a solution to an engineering need. Among the topics covered in this course are: roles, responsibilities and behaviors of a professional engineer, planning a project, project management stages, devising solutions, theories and calculations, management using a Gantt chart, evaluation techniques, communication skills, and the creation and presentation of a project report.

*Prerequisites: 00101112*

**00103205: Advanced Workshop for Electrical Engineers****1 Cr (0,3)**

This course develops high-level skills in designing and building industrial control systems. It includes a set of practical experiments covering a variety of topics, such as: starting and driving circuits of different motor types in addition to different low-current systems (fire alarm, security and IP-based CCTV systems).

*Prerequisites: 00113104*

**00103230: Electrical and Electronic Principles****4 Cr (3,3)**

This course provides students with a good and wide-ranging grasp of the fundamental principles of electrical and electronic circuits and devices. Topics included in this course are: Analysis of simple circuits with constant voltages and currents, using circuit laws, Kirchhoff's and Thevenin's laws, and the superposition principle. In addition to the analysis of simple circuits with sinusoidal voltages and currents, basis of semiconductor action and its applications to simple electronic devices, such as junction diode, Zener diode, light emitting diode, bipolar transistor, junction field-effect transistor (FET), and metal-oxide-semiconductor FET (MOSFET), highlighting the difference between analogue and digital electronics and their applications.

*Prerequisites: 00102111*

**00103280: Digital Principles****4 Cr (3,3)**

This course introduces the two main branches of digital electronics: Combinational and sequential. Topics included in this course are: Fundamental elements of digital circuits, various techniques used for analyzing digital logic circuits, such as truth tables, Boolean algebra, Karnaugh maps, and timing diagrams. In addition to key digital technologies, such as conventional TTL (transistor-transistor logic) and CMOS (complementary metal-oxide-semiconductor), field programmable gate array (FPGA) and some standard digital subsystems such as microprocessors.

*Prerequisites: 30201100*

**00103240: Electronic Circuits and Devices****4 Cr (3,3)**

This course introduces students to the use of electronics manufacturers' data to analyze the performance of circuits and devices, the operational characteristics of amplifier circuits, the types and effects of feedback on circuits performance, and the operation and application of oscillators. Students will also be introduced to the application of testing procedures to electronic devices and circuits, and the use of the findings of the tests to evaluate their operation. Among the topics included in this course are: Power amplifiers (classes A, B, and AB), operational amplifiers (inverting, non-inverting, differential, summing, integrator, differentiator), feedback types, such as open, closed, positive, and negative feedback, in addition to frequency response, stability, frequency drift, distortion, amplitude, wave shapes, and testing procedures.

*Prerequisites: 00103230*

**00103250: Instrumentation and Control Systems****4 Cr (3,3)**

This course discusses the main components of measuring systems including various types of sensing elements (such as: displacement, speed, pressure, temperature and strain), variable conditioning and signal processing techniques, in addition to signal representation methods. The course also introduces the concepts and terminology of control systems, such as: open and closed loop, discrete and analogue systems. It focuses on process controllers as a main part of control systems. Proportional-Integral-Differential (PID) controllers are investigated in details according to their mathematical models. Multiple practical experiments and simulation exercises are conducted throughout the course demonstrating conventional instrumentation circuits.

*Prerequisites: 00103230*

**00103260: Signals and Systems****3 Cr (3,0)**

This course introduces various analytical techniques for signals and systems. Topics included in this course are: Signal representation including Fourier transform, system definitions and properties such as linearity, time-invariance, and stability, in addition to the use of convolution, transfer functions, and frequency response to determine the system response. Moreover, it covers the analysis of digital filters using discrete Fourier transform and digital filter design procedures.

*Prerequisites: 00103280, 00103213*

**00103341: Analog Electronic Systems****3 Cr (2,3)**

This course provides a detailed investigation of the p-n junction, its characteristics and working principle, as it is considered the building concept of many conventional electronic devices such as various diodes, bipolar-junction (BJT) and field-effect (FET) transistors. The course also concentrates on the analysis and the design of different types of analog circuits, such as: diode circuits, FET and BJT amplifiers. It also briefs the mathematical techniques used to determine the frequency response, gain and stability of analog electronic systems.

*Prerequisites: 00103240*

**00103213: Further Mathematics****4 Cr (3,3)**

This course introduces additional mathematical topics to students, advancing their knowledge of the underpinning mathematics gained in the Engineering Mathematics course. The purpose of this course is to prepare the students to analyze and model engineering problems using mathematical techniques. Among the topics included in this course are: Number theory, complex numbers, matrix theory, linear equations, numerical integration and graphical representation of curves within an engineering context. Furthermore, this course expands students' knowledge of calculus to discover how to model and solve engineering problems using first and second order differential equations.

*Prerequisites: 00103110*

**00102321: Professional Engineering Management****4 Cr (3,3)**

This course aims to continue building-up the knowledge gained by Managing a Professional Engineering Project course, to provide the students with common professional standards and guide them on how to develop a range of employability skills. Among the topics included in this course are: engineering strategy and services delivery planning, the role of sustainability, Total Quality Management (TQM), engineering management tools, managing people and becoming a professional engineer.

*Prerequisites: 00102220*

**00103331: Industrial Power, Electronics and Storage****4 Cr (3,3)**

This course reviews the main issues related to energy demand and production, efficiency measures and policies, and interfacing methodologies used to connect renewable energy sources to the grid. It reviews the historical perspective of energy production and demand, their environmental effects and the necessity of renewable, or sustainable, energy sources. Energy auditing and management skills are delivered through this course, discussed through examples of energy efficiency in buildings and electric vehicles. Renewable energy sources are then investigated in detail, concentrating on their theoretical models, control circuits, and grid interfacing techniques. The impact of connecting renewable energy sources to the grid is also discussed, introducing the principle of smart grid.

*Prerequisites: 00103240*

**00103351: Industrial Systems****4 Cr (3,3)**

This course introduces the basics of industrial automation and discrete control systems. It summarizes the main concepts of discrete and analog, open and closed-loop control systems. Moreover, it describes each part of conventional automated industrial systems, starting from input and output devices, interfacing elements, and discrete controllers. The course also covers the creation of logic functions describing the operation of automated industrial systems, representing them using ladder diagrams, and implementing them through relay sequencers, programmable logic controllers (PLC), or modern industrial controllers such as CNC modules. Modern industrial trends are also presented in this course, such as the Internet-of-Things (IoT) and novel manufacturing technologies contributing to the fourth industrial revolution.

*Prerequisites: 00103250, 00103280*

**00103232: Further Electrical, Electronic and Digital Principles****4 Cr (3,3)**

This course focuses on using appropriate mathematical techniques to solve a range of electrical and electronic problems by applying appropriate circuit theorems and computer simulation tools. Topics include steady state circuit analysis techniques such as mesh and nodal analysis, using complex notation and phasor diagrams to analyze single and three-phase AC circuits. Terminology related to power calculations such as instantaneous power, power factor, real and reactive power are summarized based on the power triangle representation. The course also briefs the characteristics of non-linear circuits including diodes and transistors.

*Prerequisites: 00103230, 00103213*



**00103352: Further Control Systems****4 Cr (3,3)**

This course introduces the main concepts of control systems and their theoretical modelling based on realistic physical applications. It focuses on modelling electrical and mechanical systems using differential equations and Laplace transform, forming and simplifying their corresponding block diagrams and analyzing their response in terms of dynamic characteristics and stability. The course also investigates the implementation and tuning of PID controllers by detailed mathematical analysis and computer simulations.

*Prerequisites: 00103250, 00103213*

**00103490: Research Project for Electrical Engineers****4 Cr (2,6)**

This eight-month course introduces the skills necessary to deliver a complex, independently conducted, research project that fits within an electrical engineering context. Topics included in this course are: Finding a research problem, writing a research proposal, selecting a problem-solving approach, conducting literature review, analyzing data and interpreting findings, managing a research project and identifying key milestones, in addition to reporting, presenting, and publishing research outcomes.

*Prerequisites: Department Approval*

**00103361: Introduction to Electromagnetics****3 Cr (3,0)**

This course introduces the main theory of electromagnetism and its applications. It summarizes the theory of vector calculus required to solve mathematical problems related to electromagnetic fields. It then presents the derivation and the physical significance of Maxwell's equations based on electrostatics and magnetostatics. Topics include Coulomb's law, Gauss's Law, electric fields in materials, Biot-Savart's Law, Ampere's Circuit Law, magnetic fields, vectors, forces and materials. Electromagnetic waves propagation is also briefly discussed.

*Prerequisites: 00103230, 00103213*

**00103362: Communication Systems I****3 Cr (2,3)**

This course enables students to analyze and design communication systems, with an emphasis on digital communications, based on time and frequency domain analysis. Topics included in this course are: Review of Fourier transform techniques, linear systems, and filtering; power and energy spectral density of communication signals; sampling and quantization of analog signals; baseband and binary bandpass digital modulation including line coding, pulse shaping, and both pulse and carrier modulation techniques; wireless communication system concepts including link budgets and multiple access; transmitter and receiver design concepts; analysis of signal-to-noise ratio and bit error rate; and analog techniques such as amplitude modulation (AM) and frequency modulation (FM).

*Prerequisites: 00103260*

**00103333: Electrical Machines****3 Cr (2,3)**

This course provides the theoretical background of standard electrical machines. It presents the main principles of electro-magnetism, reluctance circuits and transformers operation. It provides detailed analysis of common alternating-current machines such as single-phase and three-phase motors. Different types of machines such as induction and synchronous types are compared in terms of operation, speed-torque characteristics and applications.

*Prerequisites: 00103232*

**00103534: Power Systems****3 Cr (2,3)**

This course represents the core of electrical engineering theory related to power generation, transmission and distribution networks. It introduces the basics of electrical power system analysis that deals with transmission lines, power networks, power flow and faults. Topics include basic concepts necessary for power system analysis such as: Complex power and the power triangle, direction of power flow, power in balanced three-phase systems, per-unit quantities and the single line diagram. The course covers in detail the series impedance model of transmission lines, the capacitance of transmission lines, current-voltage relations in transmission lines and an introduction to power-flow solutions.

*Prerequisites: 00103232*

**00103535: Power System Quality, Reliability and Protection****3 Cr (3,0)**

This course provides a more detailed study of electrical power systems. It includes topics covering symmetrical and unsymmetrical faults, such as: Transients in RL series circuits, fault calculations, single line-to-ground faults, line-to-line and double line-to-ground faults. It also introduces the concept of power system stability, the swing and the power-angle equations, and the qual-area criterion of stability. Protection devices and their sizing calculations, in addition to economic operation and reliability of power systems are also briefly discussed in this course.

*Prerequisites: 00103534*

**00102541: Photovoltaic Systems****3 Cr (2,3)**

This course covers an in-depth analysis of solar photovoltaic systems and technologies, and focuses on the practical design considerations. Topics covered include: Solar radiation characteristics, solar insolation over collecting surfaces and shading analysis, categories of photovoltaic systems, specification and selection of solar PV modules, types and characteristics of grid-connected inverters, fixed and tracking mounting structures, design of grid-connected PV systems using software tools, energy yield calculations, economic feasibility, testing and commissioning, operation and maintenance, off-grid PV systems, hybrid PV-systems, and storage technologies.

*Prerequisites: 00103232*

**00103542: Digital Electronic Systems****2 Cr (1,3)**

This course concentrates on the analysis of digital electronic circuits and their applications. It summarizes the theory behind the operation of field-effect transistors and metal-oxide-semiconductor field-effect transistors as discrete devices. It introduces the main principles of CMOS logic gates as the building blocks of digital logic circuits. It also delivers the ability of mathematically modelling conventional digital electronic circuits, such as: NMOS Inverters and logic circuits, CMOS inverters and logic circuits, clocked CMOS logic circuits, sequential logic circuits, memories like RAM and ROM cells. In addition to emitter-coupled logic circuits, transistor-transistor logic, Schottky transistor-transistor logic, BiCMOS digital circuits.

*Prerequisites: 00103341*

**00103563: Communication Systems II****3 Cr (3,0)**

This course enables students to conduct signal and system level analysis and design for digital communication systems. Topics included in this course are: Review of analog-to-digital conversion and digital baseband communications; review of probability and random variables; detailed analysis of digital carrier modulation formats including computation of signal-to-noise ratio, bit error rate, and power and bandwidth efficiency for amplitude-shift keying (ASK), phase-shift keying (PSK), frequency-shift keying (FSK), and quadrature-amplitude modulation (QAM); matched filter receivers, link budgets, and multiple access; and additive-white-noise Gaussian channels.

*Prerequisites: 00103362*

**00103591: Capstone Project for Electrical Engineers****3 Cr (1,6)**

An applied research project required from each student to implement the knowledge gained from the research project course (# 00132490). The students will practice proper project documentation, results presentation and defending their project outcomes in front of a specialized committee.

*Prerequisites: Department Approval*

**00103536: Advanced Electrical Machines****3 Cr (3,0)**

This course builds on the electrical machines course by discussing advanced topics in conventional motors (induction and synchronous AC machines). It also describes the theory behind special electrical machines and their applications, such as brushless DC, stepper and servo motors.

*Prerequisites: 00103333*

**00103537: Special Topics in Power Systems****3 Cr (3,0)**

This course provides a focused review of certain chosen topics in power systems engineering. Topics are chosen to keep the students up-to-date with the current technologies and advancements in electrical power systems engineering.

*Prerequisites: 00103534*

**00103538: Electrical Drive Systems****3 Cr (3,0)**

This course introduces the concept of drive systems for controlling the speed and the torque of electrical motors. It summarizes different types of electrical drive systems, a detailed review of their control circuits and their corresponding applications.

*Prerequisites: 00103333, 00103341*

**00102544: Green Buildings****3 Cr (2,3)**

This course introduces sustainability concepts in new and existing buildings and prepares the student for international certification in green buildings. Topics covered include: Green buildings rating systems, LEED concepts and categories, site sustainability strategies, water efficiency and wastewater technologies, energy performance, building simulation, renewable energy in buildings, fundamental and enhanced commissioning, sustainable building materials, indoor air quality, lighting and thermal comfort, innovative design case studies.

*Prerequisites: 00102111*

**00103543: Nano-Electronics and Information Technology****3 Cr (3,0)**

This course presents the current status of the state-of-the-art Silicon industry and its evolution, starting from the well-established micro-fabrication techniques to the proposed novel nano-fabrication trends. It focuses on the MOSFET as the main building component of the integrated circuits and the motivation behind the emergence of nanotechnology. It also presents some revolutionary applications of the novel nano-electronic devices in various areas, such as: memory and storage devices, displays, data transmission and communications and imaging systems.

*Prerequisites: 00103260, 00103542*

**00103544: Optical Electronics and Applications****3 Cr (3,0)**

This course summarizes the physics of semiconductor laser diodes and their applications in various fields such as illumination, communications, biomedical and industrial applications. It also reviews the recent trends in integrating electrical and optical devices into single electronic chips, or electro-optical integrated circuits.

*Prerequisites: 00103362, 00103341*

**00103545: Special Topics in Clinical Engineering****3 Cr (3,0)**

This course reviews the biomedical engineering technologies and managerial skills used in healthcare applications. It focuses on the design and application of electronic medical devices, in addition to healthcare environment design and development. Topics include lifecycle management, patient-safety regulations, risk assessment and management, interoperability and cybersecurity.

*Prerequisites: 00103341*

**00103564: Network Science****3 Cr (2,3)**

This course provides students with an introduction to modern networked technologies, such as wireless, social, and economic networks. Topics included in this course are: Analysis of networked technologies using analytical and engineering techniques, such as optimization, game/auction theory, graph analysis, and learning as applied to networked technologies; introduction to the basics of these techniques and their applications in networked systems; development of a network science for solving practical problems pertaining to various networked systems, such as smartphones, Wiki, Facebook, economic networks, or online video streaming software.

*Prerequisites: 00103563*

**00103565: Special Topics in Communications****3 Cr (3,0)**

This course provides a focused review of certain chosen topics in communications engineering. Topics are chosen to keep the students up-to-date with the current communication technologies and advancements.

*Prerequisites: 00103362*

**00103570: Data Structures and Algorithms****3 Cr (2,3)**

This course introduces students to data structures and how they are used in algorithms, enabling them to design and implement data structures. The course introduces the specification of abstract data types and explores their use in concrete data structures. Based on this knowledge, students should be able to develop solutions by specifying, designing, and implementing data structures and algorithms in a variety of programming paradigms for an identified need. Among the topics included in this course are: Abstract data types specification; formal data notations; data encapsulation; complex data structures; programming language implementations using handles, pointers, classes, and methods; algorithm types; data structure libraries; algorithm complexity; and asymptotic testing and benchmarking.

*Prerequisites: 30201100*

**00103571: Data Analytics****3 Cr (3,0)**

This course introduces the theoretical foundation of data analytics and a range of data analytic processes and techniques to provide hands-on experience for enhancing students' skills. Topics included in this course are: Data analytic terminologies; types of data analytics; data exploration and visualization; understanding data with descriptive, predictive and prescriptive analytics.

*Prerequisites: 00103213*

**00103572: Artificial Intelligence and Engineering Applications****3 Cr (3,0)**

This course covers the following topics: Problem solving methods; problem spaces; search techniques; knowledge representation; programming languages for AI; games; predicate logic; knowledge-based systems; planning techniques; reactive systems; artificial neural networks; natural language understanding; computer vision; and robotics.

*Prerequisites: 00103570, 00103571*

**00103573: Machine Learning****3 Cr (3,0)**

This course covers the following topics: Algorithms and principles involved in machine learning; fundamentals of representing uncertainty, learning from data, supervised learning, ensemble methods, unsupervised learning, structured models, learning theory and reinforcement learning; design and analysis of machine perception systems; design and implementation of a technical project applied to real datasets.

*Prerequisites: 00103570, 00103571*

**00103581: Embedded Systems****3 Cr (2,3)**

This course concentrates on real-time programming of embedded systems. It develops the basic understanding of embedded systems structure and terminology. It also delivers the knowledge required for embedded systems programming. Topics include micro-controller structure, I/O systems, real-time programming and debugging.

*Prerequisites: 00103341*

**00103492: Practical Training for Electrical Engineers****18 Cr (0,40)**

The practical training program is the bridge between academic study and industry. It is designed to transform the apprentice from a student to an employee. The main objective is to improve graduate readiness for full-time employment upon graduation. It is an 8-month work placement opportunity for a student where they apply the technical knowledge obtained during study and develop their workplace skills to match high international standards. The program is designed to allow updated monitoring of the apprentice progress and development.

*Prerequisites: Department Approval*

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