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توصيف برنامج الهندسة الكهربائية والتحكم

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University: **Benha University**
Faculty: **Faculty of Engineering at Shoubra**
Department: **Electrical Engineering**
Specification of **Electrical Engineering and Control (B.Sc. Program) 2020-2021**

A- Basic Information

1- Program title: Electrical Engineering and Control Program (Credit Hours)
2- Program type: Single
3- Department: Electrical Engineering
4- Coordinator: Assoc. Prof. Dr. Mohammed Anwar
5- External evaluator: Prof. Dr. Gamal Hashem
6- Internal evaluator: Prof. Dr. Mousa Awadhalla
7- Last date of program Bylaw: Faculty Council Number (8) in March 2017

B- Professional Information

1. Faculty Mission

The mission of Faculty of Engineering at Shoubra is: "The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills that qualify each engineer to compete in local and regional labor markets, the graduate will be able to innovate and become an entrepreneur. The faculty also committed to the development of engineering sciences and producing internationally distinguished scientific research, with the framework of human values and social responsibility "

2. Program Mission

"The Electrical Engineering and Control Program is committed to offer a distinguished educational service[1] by graduating engineers who are able to compete at the local and regional levels[2], and developing research studies[3] thus contributing to spread the values of innovation, entrepreneurship[4] and social responsibility[5]"

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	prepare a graduate with competencies and problem-solving	compete in local and regional labor markets	innovate and become an entrepreneur	development of engineering sciences	producing internationally distinguished scientific	human values and social responsibility
Offer a distinguished educational service [1]	√			√		
Compete at the local and regional levels [2]		√				
Performing research studies [3]					√	
Innovation and entrepreneurship [4]			√			
Social responsibility [5]						√

3. Program Objectives

The Electrical Engineering and Control (EEC) Program prepares its graduates to become intellectual leaders in industry. Graduates are grounded in scientific, mathematical, and technical knowledge and relevant technologies that give them ability to analyze, synthesize, and design engineering systems.

The EEC program aims to:

1) Provide a distinguished academic curriculum in accordance with international standards in the field of Electrical Engineering and Control to ensure continuous development and recognize the contemporary scientific issues.
2) Directing students on how to deal with technological developments and work in different societies, which supports their ability to innovate and entrepreneurship.
3) Provide students with the principals of engineering sciences and mathematics to coagulate the basics of electrical engineering and move forward to conduct advanced studies in these fields.
4) Qualify graduates to work not only in the local markets but also at the regional level, especially the Arab world and Africa, in order to achieve economic growth
5) Develop communication skills and teamwork, taking into account the professional, ethical and social aspects, so that graduates are prepared to take the responsibility and engaged in long-life learning.
6) Provide students with the ability to design renewable-energy power systems and how to install them in remote areas and to develop the optimal method for energy conservation.
7) Preparing a qualified engineer to work in the field of control systems and robotics, and to use the latest technologies in these fields.

To judge the compatibility of program mission with its objectives, the following matrix is used:

Key Words of Program Mission / Program Objectives	distinguished educational service [1]	compete at the local and regional levels [2]	developing research studies [3]	Innovation and entrepreneurship [4]	Society responsibility [5]
Objective #1	√				
Objective #2				√	
Objective #3			√		
Objective #4		√			
Objective #5					√
Objective #6	√				
Objective #7	√				

4. Graduate Attributes

According to the National Academic Reference Standard (NARS2018), the graduates of EEC program must satisfy the following attributes:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community;
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
7. Use techniques, skills and modern engineering tools necessary for engineering practice.
8. Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

Besides the above-mentioned general attributes of all Engineering graduates, the Electrical Engineering and Control program's graduates must satisfy the following attributes:

11. Design electrical power systems generated from renewable sources, using technological and professional tools.

12. Gain the skills needed for the market such as utilizing Programmable Logic Controllers (PLC), Advanced Process Control (APC), Distributed Control Systems (DCS) and Supervisory Control and Data Acquisition (SCADA).
13. Apply computer software packages in the design and simulation of various control systems as well as the power systems.
14. Testing, maintaining, and modifying conventional electrical power systems.

5. Program Competencies

According to the National Academic Reference Standard, the EEC program must satisfy the following Competencies:

1- General Engineering NARS Competencies in 2018		
Level A (NARS)	A.1	Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.
	A.2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess, and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
	A.3	Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
	A.4	Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues, and risk management principles.
	A.5	Practice research techniques and methods of investigation as an inherent part of learning.
	A.6	Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
	A.7	Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
	A.8	Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
	A.9	Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
	A.10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

2- Electrical NARS Competencies in 2018		
Level B (NARS)	B.1	Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.
	B.2	Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.
	B.3	Design and implement: elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.

2- Electrical NARS Competencies in 2018		
	B.4	Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation and evaluate its suitability for a specific application.
	B.5	Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

3- Electrical Engineering & Control ARS		
Level C (ARS)	C.1	Demonstrate additional abilities to model, design and integrate computer-operated systems including analog, digital and intelligent systems
	C.2	Design and supervise the construction of systems to generate, transmit, control and use electrical energy obtained from renewable resources.
	C.3	Apply advanced digital techniques for modeling and analyzing electrical power systems while maintain their protection.
	C.4	Develop and/or redesign components/systems in the field of industrial control for improving the quality life of humans

To judge the compatibility of program objectives with its competencies, the following matrix is used:

Program Objectives	Program Competencies																		
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
Objective #1				√					√		√					√			
Objective #2						√			√										√
Objective #3	√				√								√						
Objective #4									√			√		√					
Objective #5							√	√		√					√				
Objective #6		√	√										√				√		
Objective #7	√	√										√				√		√	

6. Academic Standards of Program

The EEC program adopted exactly **NARS** as reference academic standards (levels A & B) and **ARS** (level C) for the specialization of this program as explained in tables above.

7. Curriculum Structure and Contents

a. Program Duration: 10 semesters (5-years) based on credit-hour system.

b. Program Structure: Credit and Contact hours (1 credit hour = 1-hour lecture or 2-hour tutorial or 3-hour lab

i–   No. of Credit hours: 175 : 159 Compulsory   16 Elective

ii–   No. of Contact hours: 270 : 119 Lectures   34 Tutorial/Exercises   117 Lab

iii– Contact hours of Lectures & Tutorials: 153 hours = 56.67%

iv–   Contact hours of Lab: 117 hours = 43.33%

c. Indicative Curricula Content by Subject Area

	Subject Area	Credit Hours	%
A	Humanities and Social Sciences (Univ. Req.)	16	9.14
B	Mathematics and Basic Sciences	39	22.29
C	Basic Engineering Sciences (Faculty/Spec. Req.)	37	21.14
D	Applied Engineering and Design	38	21.71
E	Computer Applications and ICT	16	9.14
F	Projects and Practice	13	7.44
	Subtotal	159	90.86
G	Discretionary (Program character-identifying) subjects	16	9.14
	Total	175	100

d. Program Years:

Year	Credit Hours		
	Compulsory	Elective	Total
First (Preparatory)	37	0	37
Second	34	0	34
Third	34	0	34
Fourth	33	0	33
Fifth	15	16	31
Subtotal Credit Hours			169
Summer Training*			6
Total Credit Hours			175

*Students perform industrial training (1 & 2) during summer period for 6 weeks.

e. Program Levels and Courses

First Year (Preparatory Year / Zero Level of Program)

First Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	**Tut.**	**Lab.**	**Total**	
EMP101	Engineering Mathematics (1)	3	2	2	-	4	As attached matrix
EMP103	Physics (1)	3	2	-	3	5	
EMP105	Engineering Chemistry	3	2	-	3	5	
EMP106	Engineering Mechanics (1)	3	2	2	-	4	
MDP101	Engineering Drawing (1)	3	2	-	3	5	
GEN101	English Language	2	2	-	-	2	
	Total	17	12	4	9	25	

Second Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	**Tut.**	**Lab.**	**Total**	
EMP102	Engineering Mathematics (2)	3	2	2	-	4	As attached matrix
EMP104	Physics (2)	3	2	-	3	5	
EMP107	Engineering Mechanics (2)	3	2	2	-	4	
CPE101	Computer Programming	3	2	-	3	5	
MDP103	Production Technology & Workshops	3	2	-	3	5	
MDP102	Engineering Drawing (2)	3	2	-	3	5	
GEN102	Engineering & Society	2	2	-	-	2	
	Total	20	14	4	12	30	

Second Year (First Level of Program)

First Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	**Tut.**	**Lab.**	**Total**	
EEC211	Electric Circuits (1)	3	2	-	3	5	As attached matrix
MPE101	Fluid and Thermal Systems	3	2	2	-	4	
EEC212	Structured Programming	3	2	-	3	5	
EEC213	Logic Design	3	2	-	3	5	
EMP201	Engineering Mathematics (3)	3	2	2	-	4	
GEN201	Technical Report Writing	2	2	-	-	2	
	Total	17	12	4	9	25	

Second Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	Tut.	Lab.	Total	
EEC221	Electromagnetics (1)	3	2	2	-	4	
EEC222	Electric Circuits (2)	4	3	2	-	5	
EEC223	Electronics (1)	4	2	2	3	7	As attached matrix
EEC224	Signals and Systems	3	2	2	-	4	
EMP202	Engineering Mathematics (4)	3	2	2	-	4	
	Total	17	11	10	3	24	

Third Year (Second Level of Program)

First Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	Tut.	Lab.	Total	
EEC311	Electronics (2)	3	2	-	3	5	
EEC312	Electric Machines (1)	3	2	-	3	5	
EEC313	Electric Power Systems (1)	3	2	2	-	4	
EEC314	Engineering Mathematics (5)	3	2	2	-	4	As attached matrix
EEC315	Electronic Measurements	3	2	-	3	5	
GEN202	Psychology & Organization Behavior	2	2	-	-	2	
	Total	17	12	4	9	25	

Second Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	Tut.	Lab.	Total	
EEC321	Automatic Control (1)	3	2	2	-	4	
EEC322	Electromagnetics (2)	2	2	-	-	2	
EEC323	Electric Machines (2)	4	3	-	3	6	
EEC324	Communications Systems	3	2	2	-	4	As attached matrix
EEC325	Engineering Mathematics (6)	3	2	2	-	4	
GEN301	Leadership and Management Skills	2	2	-	-	2	
	Total	17	13	6	3	22	

After completion of this semester, student performs Industrial Training (1) course (INT301) for six weeks during summer corresponding to 3 Credit Hours.

Fourth Year (Third Level of Program)

First Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	Tut.	Lab.	Total	
EEC411	High Voltage Engineering (1)	3	2	-	3	5	As attached matrix
EEC412	Industrial Controls (1)	3	2	-	3	5	
EEC413	Power Electronics (1)	4	3	-	3	6	
EEC414	Electric Power Systems (2)	3	2	-	3	5	
EEC415	Automatic Control (2)	3	2	-	3	5	
GEN302	Professional Ethics	2	2	-	-	2	
	Total	18	13	-	15	28	

Second Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	Tut.	Lab.	Total	
EEC421	Microcontrollers	4	3	-	3	6	As attached matrix
EEC422	Digital Control	3	2	-	3	5	
EEC423	Electric Drive Systems (1)	3	2	-	3	5	
EEC424	Power Electronics (2)	3	2	-	3	5	
GEN401	Legislations, Contract & Procurement Management	2	2	-	-	2	
	Total	15	11	-	12	23	

After completion of this semester, student performs Industrial Training (2) course (INT401) for six weeks during summer corresponding to 3 Credit Hours.

Fifth Year (Fourth Level of Program)

First Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	Tut.	Lab.	Total	
EEC511	Graduation Project (1)	2	1	-	3	4	As attached matrix
EEC512	Robotics Engineering (1)	3	2	-	3	5	
EEC513	Power System Protection (1)	3	2	2	-	4	
EEC5XX	Select a course from "Elective Group (1)"	3	2	-	3	5	
EEC5XX	Select a 2nd course from "Elective Group(1)"	3	2	-	3	5	
EEC5XX	Select a course from "Elective Group (2)"	2	2	-	-	2	
	Total	16	11	2	12	25	

Second Semester:

Code	Course Title	Credit Hours	Contact hours / week				Program NARS Covered
			Lect.	**Tut.**	**Lab.**	**Total**	
EEC521	Graduation Project (2)	2	-	-	6	6	As attached matrix
EEC522	Intelligent Control	3	2	-	3	5	
EEC5XX	Select a 3rd course from "Elective Group (1)"	3	2	-	3	5	
EEC5XX	Select a 4th course from "Elective Group (1)"	3	2	-	3	5	
EEC5XX	Select a 2nd course from "Elective Group(2)"	2	2	-	-	2	
GEN402	Human Resources Management	2	2	-	-	2	
Total		15	10	-	15	25	

Elective **Group I** (students must select 4 courses from that list)

Code	Course Title	Credit Hours	No. of hours / week				Program NARS Covered
			Lect.	**Tut.**	**Lab**	**Total**	
EEC551	Industrial Controls (2)	3	2	-	3	5	As attached matrix
EEC552	Power Electronics (3)	3	2	-	3	5	
EEC553	Embedded Systems	3	2	-	3	5	
EEC554	Smart Grid	3	2	-	3	5	
EEC555	Power System Control	3	2	-	3	5	
EEC556	Robotics Engineering (2)	3	2	-	3	5	
EEC557	Special Electrical Machines	3	2	-	3	5	
EEC558	Electrical Drive Systems (2)	3	2	-	3	5	
EEC559	Protection of Power Systems (2)	3	2	-	3	5	
EEC560	Electric Power Plants	3	2	-	3	5	
EEC561	Power Distribution Systems	3	2	-	3	5	
EEC562	Modern Control Systems	3	2	-	3	5	
EEC563	High Voltage Engineering (2)	3	2	-	3	5	
EEC564	Utilization of Electric Energy	3	2	-	3	5	
EEC565	Renewable Energy Systems	3	2	-	3	5	
EEC566	Technology of Electric Power Station	3	2	-	3	5	
EEC567	Selected Topics in Electrical/Control Engineering	3	2	-	3	5	
Total		12	8	-	12	20	

Elective **Group 2** (students must select 2 courses from that list)

Code	Course Title	Credit Hours	No. of hours / week				Program NARS Covered
			Lect.	**Tut.**	**Lab**	**Total**	
EEC568	Management of Energy Resources	2	2	-	-	2	As attached matrix
EEC569	Operations research	2	2	-	-	2	
EEC570	Management of international business	2	2	-	-	2	

Code	Course Title	Credit Hours	No. of hours / week				Program NARS Covered
			Lect.	Tut.	Lab	Total	
EEC571	Environmental Impacts of Electric Energy	2	2	-	-	2	
EEC572	Electrical Safety	2	2	-	-	2	
EEC568	Management of Energy Resources	2	2	-	-	2	
Total		4	4	-	-	4	

8. Program Admission Requirements

Having Egyptian Secondary education or equivalent certificate with major in Mathematics, then after passing the preparatory year and fulfilling the admission requirements the students will be able to attend the EEC program.

9. Regulations for progression and program completion

a. The student can register a number of courses with no less than 12 credit hours in each semester within the registration dates and rules issued by the college and published in the student's guide. Registration is not considered final until paying the tuition fees. Moreover, student can register a number of courses according to the following table:

Credit Hours Registered / semester	GPA
Up to 21	≥ 3
Up to 18	< 3 and ≥ 2
Up to 14	< 2 and ≥ 1

b. The student cannot register a course that have a prerequisite,
c. The student gets a bachelor's degree of Engineering Science if he/she successfully passed 175 credit hours with minimum GPA of 2.0,
d. The grades of the successful / failed student in a course and in the general grade are evaluated as follows:

Grade	% achieved	Points
A+	≥ 97	4.0
A	≥ 93 and < 97	4.0
A–	≥ 89 and < 93	3.7
B+	≥ 84 and < 89	3.3
B	≥ 80 and < 84	3.0
B–	≥ 76 and < 80	2.7
C+	≥ 73 and < 76	2.3
C	≥ 70 and < 73	2.0
C–	≥ 67 and < 70	1.7
D+	≥ 64 and < 67	1.3
D	≥ 60 and < 64	1.0
F	< 60	0

The course points are calculated by multiplying the achieved points in that course by its credit hours, The semester points are the sum of all achieved points of courses registered in that semester.

$$semester\ GPA = \frac{semester\ points}{total\ credit\ hours\ of\ the\ semester}$$

By the same concept, the cumulative GPA is calculated by

$$cumulative\ GPA = \frac{total\ points}{total\ credit\ hours}$$

− The student is awarded an honor degree if his/her cumulative GPA is ≥ 3.3 in all semesters of study. Moreover, he/she did not get grade (F) in any course.

10. Teaching and Learning Methods

Program Competencies		Teaching and Learning Methods									
		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A1	√	√	√							
	A2				√	√			√	√	
	A3	√	√	√							√
	A4	√	√	√			√				
	A5									√	√
	A6				√	√	√		√		
	A7							√		√	√
	A8				√		√				
	A9				√		√			√	
	A10				√					√	√
Level B	B1	√	√	√						√	√
	B2	√	√	√					√		
	B3	√	√	√		√		√			
	B4	√	√	√					√		
	B5	√	√	√			√				
Level C	C1	√	√		√				√	√	
	C2	√	√		√			√	√	√	

Program Competencies		Teaching and Learning Methods									
		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
	C3	√	√		√	√			√	√	
	C4	√	√		√		√		√	√	

11. Assessment Methods

Program Competencies		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√		√			√	√		√
	A2			√		√		√	√		√
	A3	√	√		√				√	√	
	A4	√	√		√				√		
	A5						√	√			√
	A6					√		√	√	√	√
	A7							√	√	√	
	A8			√				√	√	√	
	A9			√				√	√		
	A10						√		√	√	√
Level B	B1	√	√	√	√			√	√		
	B2	√	√		√	√		√	√		
	B3	√	√	√				√	√		
	B4	√	√	√	√			√	√		
	B5	√	√		√			√	√		

Program Competencies		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level C	C1	√	√		√				√	√	
	C2	√	√		√				√	√	
	C3	√	√		√				√	√	
	C4	√	√		√				√	√	

12. Evaluation of Program Competencies

Evaluator	Tool	Sample
1. Senior students	Evaluation sheet	25%
2. Alumni	Evaluation sheet & interview	5%
3. Stakeholders (Employers)	Evaluation sheet & interview	5
4. External Evaluator(s) (External Examiner(s))	Report	1
5. Internal Evaluator(s) (Internal Examiner(s))	Report	1

Appendix: Course Matrix with program Competences:

Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
EMP101	Engineering Mathematics (1)	√		√																
EMP103	Physics (1)	√	√					√												
EMP105	Engineering Chemistry	√	√					√												
EMP106	Engineering Mechanics (1)	√		√																
MDP101	Engineering Drawing (1)	√					√		√											
GEN101	English Language							√	√											
EMP102	Engineering Mathematics (2)	√		√																
EMP104	Physics (2)	√	√					√												
EMP107	Engineering Mechanics (2)	√		√																
CPE101	Computer Programming	√			√		√	√		√	√									
MDP102	Engineering Drawing (2)		√		√				√											
MPD103	Production Technology & Workshops		√				√		√											
GEN102	Engineering & Society			√	√															
EEC211	Electric Circuits (1)	√	√				√		√			√								
MPE101	Fluid and Thermal Systems	√		√	√				√											
EEC212	Structured Programming	√	√	√				√	√	√			√		√					

Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
EEC213	Logic Design	√	√	√	√		√	√		√			√			√				
EMP201	Engineering Mathematics (3)	√				√	√	√			√									
GEN201	Technical Report Writing							√	√											
EEC221	Electromagnetics (1)	√				√		√	√			√								
EEC222	Electric Circuits (2)	√	√					√				√			√					
EEC223	Electronics (1)	√	√			√	√	√					√	√	√					
EEC224	Signals and Systems	√	√	√				√					√		√					
EMP202	Engineering Mathematics (4)	√				√	√	√			√									
EEC311	Electronics (2)		√	√		√	√				√		√	√		√				
EEC312	Electric Machines (1)	√	√	√							√				√			√		√
EEC313	Electric Power Systems (1)	√	√	√					√			√							√	
EEC314	Engineering Mathematics (5)	√	√	√				√			√		√		√					
EEC315	Electronic Measurements	√	√		√		√				√			√		√	√			
GEN202	Psychology & Organization Behavior						√	√	√	√	√									
EEC321	Automatic Control (1)	√	√						√		√		√		√		√			√
EEC322	Electromagnetics (2)		√	√		√					√	√	√				√		√	
EEC323	Electric Machines (2)		√		√		√				√	√			√	√	√		√	
EEC324	Communications Systems	√	√					√							√					

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Course Code	Course Name	Engineering Competencies (2018)										"Department" Electrical Engineering Competencies (NARS)					"Discipline" Electrical Engineering and Control Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4
EEC325	Engineering Mathematics (6)	√	√	√				√			√		√		√					
GEN301	Leadership & Management Skills					√		√	√	√	√									
EEC411	High Voltage Engineering (1)		√				√	√			√	√			√					√
EEC412	Industrial Controls (1)		√	√	√		√				√		√	√		√	√			√
EEC413	Power Electronics (1)		√				√				√		√		√				√	
EEC414	Electric Power Systems (2)		√	√		√			√		√	√			√				√	√
EEC415	Automatic Control (2)		√	√	√						√		√		√		√			
GEN302	Professional Ethics			√					√	√										
EEC421	Microcontrollers		√				√				√		√	√			√			√
EEC422	Digital Control		√	√		√			√				√		√				√	√
EEC423	Electric Drive Systems (1)		√				√				√		√		√		√		√	√
EEC424	Power Electronics (2)		√				√				√		√		√		√			
GEN401	Legislations, Contract and Procurement Management					√		√	√	√	√									
EEC511	Graduation Project (1)		√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√
EEC512	Robotics Engineering (1)		√		√	√	√	√			√	√		√	√		√			√
EEC513	Power System Protection (1)	√						√	√			√	√		√				√	√
EEC521	Graduation Project (2)		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

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EEC522	Intelligent Control		√	√	√		√		√		√		√	√	√		√			√
GEN402	Human Resources Management				√		√													
EEC380	Field Training (1)		√		√		√	√	√		√	√	√	√	√	√	√	√	√	√
EEC480	Field Training (2)		√		√		√	√	√		√	√	√	√	√	√	√	√	√	√
ELECTIVE COURSES																				
EEC551	Industrial Controls (2)		√	√	√		√				√		√	√		√	√			√
EEC552	Power Electronics (3)								√		√		√		√		√			√
EEC553	Embedded Systems								√		√		√	√			√			√
EEC554	Smart Grid		√			√		√	√		√	√				√		√	√	√
EEC555	Power Systems Control		√				√				√	√			√		√	√	√	
EEC556	Robotics Engineering (2)		√		√	√	√				√	√		√	√		√			√
EEC557	Special Electrical Machines		√		√		√				√	√			√		√		√	
EEC558	Electrical Drive Systems (2)		√				√				√		√		√		√		√	√
EEC559	Protection of Power Systems (2)			√		√		√	√		√		√		√		√	√	√	
EEC560	Electric Power Plants		√	√					√		√	√	√		√	√		√	√	
EEC561	Power Distribution Systems			√	√		√				√			√		√		√		
EEC562	Modern Control Systems			√				√			√		√	√			√			√

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EEC563	High Voltage Engineering (2)		√		√	√		√	√			√			√			√	√	
EEC564	Utilization of Electric Energy	√	√	√					√				√			√	√	√	√	
EEC565	Renewable Energy Systems								√		√		√			√	√	√	√	
EEC566	Technology of Electric Power Station		√		√	√		√	√					√	√				√	
EEC567	Selected Topics in Electrical/Control Engineering											√	√	√	√	√	√	√	√	√
EEC568	Management of Energy Resources				√			√	√	√		√	√		√				√	√
EEC569	Operations Research			√		√			√		√	√								
EEC570	Management of international business					√		√	√	√	√									
EEC571	Environmental Impacts of Electric Energy			√	√	√					√	√			√				√	
EEC572	Electrical Safety	√						√	√		√	√			√				√	√

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فريق توصيف البرنامج وتبني المعايير الأكاديمية لبرنامج الهندسة الكهربائية والتحكم (نظام الساعات المعتمدة)

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