Undergraduate Programs

Electrical Engineering Department

Program Specification

I. Basic Information:

1- Program name	Electrical Power and Machines Engineering
2- Program type	Single
3- Adoption Date	2003
4- Year of specification approval	2021
5- Study system	Semester System
6- Program Coordinator	Prof. Dr./ Ashraf Salah El Din Zein El Din

II. Specialized Information:

1- Program Vision

Leadership and distinction in the field of electrical power and machines engineering on local, regional, and international levels.

2- Program Mission

The program prepares qualified engineers for the labor market in the field of Electrical Power and Machines Engineering, capable of innovation, productivity, and keeping with the development in accordance with the national academic reference standards (NARS) and professional ethics, by providing high-quality content in education and enabling scientific research to achieve sustainable development and contribute to community service.

3- Program Aims

The program aims are:

- To prepare undergraduate students who will be able to create new ways to meet society's needs through applying fundamentals of engineering sciences to practical problems using design, analyses, and syntheses of electrical components, circuits, and systems. Thus, becoming successful solvers of engineering problems, lifelong learners, innovators, and professionals in the field of electrical power and machines.
- To prepare engineers who will become leaders in the electrical power and machines engineering profession, and be able to shape the social, intellectual, business, and technical activities.
- To prepare engineers who will be able to work on electrical power and machines systems including the design and realization of such systems.
- To ensure that students are exposed to elements of social sciences, humanities, and environmental studies so that they understand the necessity for professionalism, ethical responsibilities, and the needs to function in multidisciplinary teams.
- To prepare students to express themselves effectively in both oral and written communications.
- To prepare students for engineering analyses and problem solving using appropriate mathematical and computational methodologies.
- To teach students to use experimental and data analysis techniques for electrical power and machines engineering applications.
- To provide the students with awareness of tools and skills necessary for participating effectively in building a strong national economy and to meet current and future modern industry needs.
- To provide various industries with highly qualified electrical power and machines engineers who have a broad knowledge of electrical engineering and related principles, theories, and applications.

4- Program Objectives

The graduates of the engineering programs should be able to:

1-Apply knowledge of mathematics, science, and engineering concepts to the solution of engineering problems.
2- Design a system component and process to meet the required needs within realistic constraints.
3- Design and conduct experiments as well as analyze and interpret data.
4- Identify, formulate, and solve fundamental engineering problems.
5- Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.
6- Work effectively within multi-disciplinary teams.
7- Communicate effectively.
8- Consider the impacts of engineering solutions on society and environment.
9- Demonstrate knowledge of contemporary engineering issues.
10- Display professional and ethical responsibilities, and contextual understanding.
11- Engage in self- and life- long learning.
12- Design and supervise the construction of systems to generate, transmit, control and use electrical energy.
13- Design and develop heavy equipment, such as generators, motors, transmission lines and distributing systems.
14- Plan and manage engineering activity during the diverse phases of electric power generation, transmission, and control
15- Prepare and reviews simple sketches, specifications and data sheets for electric power generation, control, and distribution systems
16- Perform design reviews and checks for electric power generation and distribution systems
17- Perform review of supplier documentation for compliance with specifications
18- Develop load lists
19- Develop low and high voltage power systems and protection.

5- Learning Outcomes (LO's)

5-1 Level A: Competencies of Engineering Graduate

The engineering graduate must be able to:

A1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.

A2) 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.

A3) 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.

A4) Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues, and risk management principles.

A5) Practice research techniques and methods of investigation as an inherent part of learning.

A6) Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

A7) Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

A8) Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

A9) Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

A10) Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

5-2 Level B: Competencies of Basic Electrical Engineering

Electrical Engineering graduate must be able to:

B1) 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.

B2) Design, model, and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.

B3) Design and implement elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools

B4) 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.

B5) Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

5-3 Level C: High Specialized Competencies

The graduates of the Electrical Power and Machines Engineering program should be able to:

C1) Design and perform experiments, as well as analyze and interpret experimental results related to electrical power and machines systems.
C2) Test and examine components, equipment and systems of electrical power and machines.
C3) Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.
C4) Specify and evaluate manufacturing of components and equipment related to electrical power and machines.
C5) Apply modern techniques, skills and engineering tools to electrical power and machines engineering systems.

6- Attributes of the Graduates

6-1 The Attributes of the Engineering Graduates

The graduates of the engineering programs should be able to:

a) Apply knowledge of mathematics, science, and engineering concepts to the solution of engineering problems.
b) Design a system; component and process to meet the required needs within realistic constraints.
c) Design and conduct experiments as well as analyze and interpret data.
d) Identify, formulate, and solve fundamental engineering problems.
e) Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.
f) Work effectively within multi-disciplinary teams.
g) Communicate effectively.
h) Consider the impacts of engineering solutions on society & environment.
i) Demonstrate knowledge of contemporary engineering issues.
j) Display professional and ethical responsibilities, and contextual understanding.
k) Engage in self- and life- long learning.

6-2 The Attributes of Electrical Power and Machines Engineering Graduates

In addition to the general attributes of engineer, the electrical power and machines engineer should be able to:

a) Design and supervise the construction of systems to generate, transmit, control, and use electrical energy.

b) Design and develop heavy equipment, such as generators, motors, transmission lines and distributing systems.
c) Plan and manage engineering activity during the diverse phases of electric power generation, transmission, and control.
d) Prepare and reviews simple sketches, specifications and data sheets for electric power generation, control, and distribution systems.
e) Perform design reviews and checks for electric power generation and distribution systems.
f) Perform review of supplier documentation for compliance with specifications.
g) Develops load lists.
h) Develops low voltage power systems.

7- Academic Standards

National Academic reference Standards of Mechanical engineering program (2018), which were issued by the National Authority for Quality Assurance & Accreditation of Education NAQAAE.

8- Reference standards

• None

9- Program Structure and Contents

Program duration:
The program duration is five years, 10 semesters.
Program structure:

Hours	129	Theoretical	131	Practical	300	Total
	260	Mandatory	40	Elective	21	Not bound

10- Program Courses (Level/Semester)

a. Mandatory Courses

Code	Course	Course Hours/Week				Level	Semester
		Lecture	Tutoria	Labs.	Total		
BES 011	Mathematics (1-A)	4	2	-	6	Preparatory year	1st semester
BES 012	Physics (1-A)	3	-	2	5		
BES 003	Mechanics	2	2	-	4		
BES 013	Chemistry	2	-	2	4		
PRE 001	Engineering Drawing & Projection	2	4	-	6		
BES 014	History of Eng- Sciences	2	1	-	3		
BES 004	English Language.	-	2	-	2		
BES 021	Mathematics (1-B)	4	2	-	6	Preparatory year	2nd semester
BES 022	Physics (1-B)	3	-	2	5		
BES 003	Mechanics	2	2	-	4		
PRE 021	Production Engineering	2	-	2	4		
PRE 001	Engineering Drawing & Projection	2	4	-	6		
ELE 021	Computer and Programming	2	-	1	3		
BES 004	English Language	-	2	-	2		
BES111	Mathematics (2)	4	4	-	8	1st year	1st semester
PRE117	Applied mechanics	2	1	1	4		
BES115	Physics (2)	2	2	2	6		
ELE111	Electrical engineering	4	2	2	8		
ELE112	Computer Applications (1)	2	-	2	4		
ELE121	Electronics	4	2	2	8	1st year	2nd semester
ELE122	Electrical materials	3	2	-	5		
ELE123	Energy Conversion	2	2	-	4		
MPE127	Fluid mechanics	2	2	2	6		
MPE128	Thermodynamics	2	2	-	4		
PRE127	Economy &projects managements	2	1	-	3		
BES211	Mathematics (3)	2	2	-	4	2nd year	1st semester
ELE211	Electrical power engineering (1)	4	2	2	8		
ELE212	Measurements & Measuring instruments	4	2	2	8		
ELE213	Electrical circuits theory	4	2	-	6		
ELE214	Computer Application (2)	2	-	2	4		
ELE221	Electrical machines (1)	4	2	2	8	2nd year	2nd semester
ELE222	Digital electronics	4	2	2	8		
ELE223	Electromagnetic field theory	2	-	-	4		
ELE224	Object Oriented Programming	2	2	2	4		
BES311	Mathematics (4)	2	2	-	4	3rd year	1st semester
ELE311	Electrical power engineering (2)	3	2	-	5		
ELE312	Electric machines (2)	4	2	-	6		
ELE313	Automatic control systems	4	2	-	6		
ELE314	Power electronics	4	2	-	6		
ELE305	Electrical testing (1)	-	-	3	3		

ELE323	High voltage engineering	3	1	2	6	3rd year	2nd semester
ELE324	Computer engineering	2	2	1	5		
ELE305	Electrical testing (1)	-	-	3	3		
ELE325	Writing Technical Reports	2	-	-	2		
ELE 411	Electrical power system analysis	4	2	-	6	4th year	1st semester
ELE 412	Electric machine design	4	2	-	6		
ELE 415	Electrical testing (2)	-	-	3	3		
ELE 406	Project	-	3	-	3		
ELE421	Electric drives	4	2	-	6	4th year	2nd semester
ELE422	Power system protection	3	1	2	6		
ELE423	Digital control	3	2	2	7		
ELE 406	Project	-	3	-	3		

b. Elective Courses

Number	Code	Course	Course Hours/Week				Level	Semester
			Lectures	Tutorials	Labs.	Total		
Elective Course (1)	MPE 227A	Heat Engines	3	2	1	6	2nd year	2nd semester
	MPE 227B	Hydraulic Machines	3	2	1	6		
Elective Course (2)	MPE 327A	Mechanical Power Stations	2	2	-	4	3rd year	2nd semester
	MPE 327B	Hydraulic Systems	2	2	-	4		
Elective Course (3)	ELE 321A	New and renewable energy.	2	2	-	4		
	ELE 321B	Programmable logic controller and its applications.	2	2	-	4		
	ELE 321C	Advanced programming and their applications.	2	2	-	4		
	ELE321D	Switchgear Technology	2	2	-	4		
Elective Course (4)	ELE 322A	Special electric machines.	4	2	-	6		
	ELE 322B	Optimization methods in electric power systems.	4	2	-	6		
	ELE 322C	Programming in Machine Languages.	4	2	-	6		
Elective Course (5)	ELE 413A	Modern analysis of electric machines.	4	2	-	6	4th year	1st semester
	ELE 413B	Analysis of faulted power systems.	4	2	-	6		
	ELE 413C	Data Base System	4	2	-	6		
	ELE413D	Power System Planning	4	2	-	6		
	ELE413E	Digital Signal Processing	4	2	-	6		
Elective Course (6)	ELE 414A	Electric machine dynamics.	4	2	-	6		
	ELE 414B	Economic operation of electric power systems.	4	2	-	6		
	ELE 414C	Computer Control.	4	2	-	6		
Elective Course (7)	ELE424A	Power Electronics technology.	2	2	-	4	4th year	2nd semester
	ELE424B	Control of electrical power systems.	2	2	-	4		
	ELE424C	Application of protection systems	2	2	-	4		
	ELE424D	Protection Transducers and Grounding	4	2	-	6		
	ELE424E	Expert Systems	2	2	-	4		
Elective Course (8)	ELE 425A	Control of electric machines	2	2	-	4		
	ELE 425B	Power systems stability.	2	2	-	4		
	ELE 425C	Insulation Co-ordination	2	2	-	4		
	ELE425D	Static Relay and Computer Applications to Protection.	2	2	-	4		
	ELE425E	Robotics.	2	2	-	4		

11- Program Courses (Specialization)

11-1-Social Sciences and Humanities

Code No.	Course	Lec.	Tutorial	Lab	Total Hours
BES 014	History of Eng- Sciences	2	1	-	3
BES 004	English Language.	-	2	-	2
BES000	Human Rights	1	--	-	1
ELE 021	Computer and Programming	2	-	1	3
BES0000	Quality Assurance	1	--	-	1
ELE112	Computer Applications (1)	2	-	2	4
ELE214	Computer Application (2)	2	-	2	4
ELE224	Object Oriented Programming	2	-	2	4
ELE325	Writing Technical Reports	2	-	-	2
Total Hours					24

11-2 Projects and Business Management

Code No.	Course	Lec.	Tutorial	Lab	Total Hours
PRE021	Production Engineering	2	-	2	4
PRE127	Economy &projects managements	2	1	-	3
Total Hours					7

11-3 Mathematics and Basic Sciences

Code No.	Course	Lec.	Tutorial	Lab	Total Hours
BES 011	Mathematics (1-A)	4	2	-	6
BES 012	Physics (1-A)	3	-	2	5
BES 003	Mechanics	2	2	-	4
BES 013	Chemistry	2	-	2	4
BES 021	Mathematics (1-B)	4	2	-	6
BES 022	Physics (1-B)	3	-	2	5
BES 003	Mechanics	2	2	-	4
BES111	Mathematics (2)	4	4	-	8
BES115	Physics (2)	2	2	2	6
ELE122	Electrical materials	3	2	-	5
ELE123	Energy Conversion	2	2	-	4
BES211	Mathematics (3)	2	2	-	4
BES311	Mathematics (4)	2	2	-	4
Total Hours					65

11-4-Engineering Culture

Code No.	Course	Lec.	Tutorial	Lab	Total Hours
ELE111	Electrical engineering	4	2	2	8
ELE223	Electromagnetic field theory	2	2	-	4
Total Hours					12

11-5 Basic Engineering Sciences

Code No.	Course	Lec.	Tutorial	Lab	Total Hours
PRE 001	Engineering Drawing & Projection	4	8	-	12
PRE117	Applied mechanics	2	1	1	4
ELE121	Electronics	4	2	2	8
MPE127	Fluid mechanics	2	2	2	6
MPE128	Thermodynamics	2	2	-	4
ELE212	Measurements & Measuring instruments	4	2	2	8
ELE213	Electrical circuits theory	4	2	-	6
ELE222	Digital electronics	4	2	2	8
MPE227	Elective Course (1)	3	2	1	6
ELE313	Automatic control systems	4	2	-	6
MPE327	Elective Course (2)	2	2	-	4
ELE321	Elective Course (3)	2	2	-	4
ELE324	Computer engineering	2	2	1	5
ELE423	Digital control	3	2	2	7
Total Hours					88

11-6 Engineering and Design Applications

Code No.	Course	Lec.	Tutorial	Lab	Total Hours
ELE211	Electrical power engineering (1)	4	2	2	8
ELE221	Electrical machines (1)	4	2	2	8
ELE311	Electrical power engineering (2)	3	2	-	5
ELE312	Electric machines (2)	4	2	-	6
ELE314	Power electronics	4	2	-	6
ELE322	Elective Course (4)	4	2	-	6
ELE323	High voltage engineering	3	1	2	6
ELE411	Electrical power system analysis	4	2	-	6
ELE412	Electric machine design	4	2	-	6
ELE413	Elective Course (5)	4	2	-	6
ELE414	Elective Course (6)	4	2	-	6
ELE421	Electric drives	4	2	-	6
ELE422	Power system protection	3	1	2	6
ELE424	Elective Course (7)	2	2		4
ELE425	Elective Course (8)	2	2		4
Total Hours					89

11-7 Project and Practice

Code No.	Course	Lec.	Tutorial	Lab	Total Hours
ELE305	Electrical testing (1)	-	-	6	6
ELE415	Electrical testing (2)	-	-	3	3
ELE406	Project	-	6	-	6
Total Hours					15

12- Enrollment Requirements

- The student is enrolled for the bachelor's degree in engineering in one of the scientific electrical engineering (specializations) according to acceptance rules set by the coordination office in conformity with the decisions of the Universities Supreme Council.
- The study begins with a preparatory year for all students and the specialization starts with the first year.
- Students are distributed among the different departments according to rules set by the faculty council.

13- Rules for Completing the Program

- The student is promoted to the next university year if he succeeds all courses of his university year, or he fails in not more two courses in his year or previous years as well as any number of humanity or cultural courses.
- The study follows the semester system with two semesters per year. The time for the bachelor's degree is four years preceded by a preparatory year. Each semester extends about 15 weeks.
- The student must attend more than 75% of the lectures, tutorials, and laboratory exercises for each course, as a condition for taking the final examination in the attended courses. Based on the request of the council of the concerned department and the approval of the faculty council, the student who does not meet the 75% attendance will be deprived from taking the final examination. In this case, the student is considered to fail the courses he deprived from taking their final examination
- The fourth (final) year students prepare a graduation project during the study year. The department councils determine its subjects. A four-week additional period after the final exams of the second semester is assigned to the graduation project.
- The council of each department should set a program for obligatory training of the second- and third-year students during the summer vacation. The training period extends for four weeks inside or outside the faculty laboratories and workshops under the supervision of the teaching staff. Student can divide training period in two parts.
- The department councils arrange scientific tours for the third- and fourth-year students. The tours are aimed at visiting industrial firms, engineering, cultural and service establishments to have the students aware with the available technological systems. The tour is performed under the supervision of teaching staff from the concerned scientific departments. The arrangement of scientific tours for visiting

industrial or engineering establishments extends to all students of the scientific departments.

- The student is entitled to be examined in courses he failed with the students currently studying these courses. In case the student score is 65% and above from the course maximum mark, his mark is reduced to that of the upper limit of "PASS" grade.
- The mark and grade remain the same without change for the student who failed to appear for an examination due to an acceptable excuse.
- In November, an examination is held for the final-year students who fail not more than two courses and any number of humanity cultural courses. If they fail again, they are entitled to be examined in the failed courses with the semester students studying these courses.
- Without desecration of Articles 83, 84 and 85 of the executive bylaw of the University Regulation Law, the successful completion of a course is evaluated according to grade points as follows:

Excellent	Points from	85%	to	100%
Very Good	Points from	75%	to less than	85%
Good	Points from	65%	to less than	75%
Pass	Points from	50%	to less than	65%

- The course in which the student fails its examination is evaluated by one of the following grades:

Poor	Points from	٪30	to less than	٪50
Very Poor			less than	٪30

- The course which is taught in one semester and has one examination mark and more than examination answer sheets, is treated as one- course as regards the course evaluation.
- The partitioned course (spitted into two parts, one in the first semester and the other in the second semester) is considered one course. The student succeeds if the total mark of the two parts exceeds the succeeding limit. If the student fails the course, he is entitled to be examined in the two parts of the course.
- The humanity and cultural courses are not counted as non-passing (failing) courses. The student has to pass these courses before awarding the bachelor's degree.
- If a course includes written and oral/lab tests, the course evaluation is made according to the total mark of all tests in addition to the academic standing (yearly work) throughout the year. No mark is recorded for the student who fails to appear in the written examination.

14- Teaching and Learning Methods

Lecture
Presentation and Monitoring
Discussions
Tutorials
Problem Solving
Brainstorming
Projects
Site Visits
Research and Reporting
Group Working
Discovering
Simulation and Modelling
Lab. Experiments

15- Student Assessment (Methods and Rules for Student Assessment)

Written Examine
Oral Examine
Tutorial Assessment
Project
Model
Research & Report
Quiz
Presentation
Discussion
Laboratory Test
Home Exams

The implementation abovementioned teaching and assessment methods can be hybridized with online concerning the available online facilities by Menoufia University as addressed in the report entitled “Self-Assessment for Quality Requirements of Online Teaching-Hybrid Learning in Faculty of Engineering, Menoufia University”.

16- Program Evaluation

Evaluator	Tools	Sample Evidence
1-Senior Students	-Meeting -Questionnaires	25% of the student
2-Alumni	-Meeting	
3-Stakeholders	-Meeting -Questionnaires	Samples representative
4-Internal Evaluator	-Reviewing according to the internal evaluator.	Reports
4-External Evaluator	-Reviewing according to the external evaluator.	Reports
5-Others	None	

Coordinator of Program Management Committee	**Head of Electrical Dept. Council**
Prof.Dr./ Ashraf Salah El Din Zein El Din ***Date:***	***Prof. Dr./ Nagy I. Elkalashy*** ***Date:***

Appendix 1

Matching matrix of program Aims and Competencies-NARS2018

		NARS2018		
		Engineering Competencies (Level A-NARS2018)	Basic Electrical Engineering Competencies (Level B-NARS2018)	High Specialized Competencies (Level C-NARS2018)
Program Aims	Aim-1	A1	B1, B5	C5
	Aim-2	A3	-	C3, C4
	Aim-3	-	B2, B3	C1, C2
	Aim-4	A3, A7, A9	-	C4, C5
	Aim-5	A8	-	C3
	Aim-6	A1, A10	B2	C1
	Aim-7	A2, A5	B4	C1
	Aim-8	A4, A6	-	C4
	Aim-9	A4	B1, B2, B3, B5	C3, C5

Appendix 2

Matching matrix of the program attributes and competencies-NARS2018

		NARS2018		
		Engineering Competencies (Level A-NARS2018)	Basic Electrical Engineering Competencies (Level B-NARS2018)	High Specialized Competencies (Level C-NARS2018)
Attributes of Engineering Graduates	a	A1, A9, A10		
	b	A3, A6		
	c	A2, A5, A6		
	d	A1, A2, A4, A5		
	e	A3, A4, A7, A8		
	f	A6, A7, A8, A9		
	g	A7, A8		
	h	A3, A10		
	i	A3, A9, A10		
	j	A1, A3, A4		
	k	A9, A10		
Attributes of Electrical Power and Machines Engineering Graduate	a		B1, B5	C3, C5
	b		B2, B3	C1, C5
	c		B4, B5	C3, C5
	d		B5	C3
	e		B2, B3	C1, C2
	f		B5	C4
	g		B1, B5	C3, C4, C5
	h		B5	C3, C4, C5

Appendix 3

Matching matrix of the program aims and graduate attributes

		Program Aims								
		Aim-1	Aim-2	Aim-3	Aim-4	Aim-5	Aim-6	Aim-7	Aim-8	Aim-9
Attributes of Engineering Graduates	a	√			√		√			
	b		√		√				√	
	c							√	√	
	d	√		√			√	√	√	√
	e		√		√	√			√	√
	f				√	√			√	
	g				√	√				
	h		√		√		√			
	i		√		√		√			
	j	√	√		√		√		√	√
	k				√		√			
Attributes of Electrical Power and Machines Engineering Graduate	a	√	√		√	√				√
	b	√		√	√	√	√	√		√
	c	√	√		√	√		√		√
	d	√	√			√				√
	e	√	√	√			√	√		√
	f	√	√		√				√	√
	g	√	√		√	√			√	√
	h	√	√		√	√			√	√

Appendix 4

Matching matrix of the program sciences and graduate attributes

		Program Sciences						
		Social Sciences and Humanities	Projects and Business Management	Mathematics and Basic Sciences	Engineering Culture	Basic Engineering Sciences	Engineering and Design Applications	Project and Practice
Attributes of Engineering Graduates	a			✓	✓	✓	✓	
	b		✓				✓	✓
	c			✓		✓	✓	
	d		✓		✓	✓		
	e		✓		✓	✓	✓	✓
	f	✓	✓		✓			
	g	✓	✓		✓			
	h	✓			✓		✓	
	i	✓			✓		✓	
	j	✓	✓		✓			
	k				✓		✓	
Attributes of Electrical Power and Machines Engineering Graduate	a		✓				✓	✓
	b		✓				✓	✓
	c		✓				✓	✓
	d		✓				✓	✓
	e		✓				✓	✓
	f		✓		✓			
	g		✓				✓	✓
	h		✓				✓	✓

Appendix 5
Map Competencies to Courses: Matching program LOs to course Los

Code	Course	Level A										Level B					Level C				
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5
BES011	Mathematics (1-A)	X							X	X											
BES012	Physics (1-A)	X	X			X			X												
BES003	Mechanics	X							X	X											
BES013	Chemistry	X	X						X												
PRE001	Engineering Drawing & Projection	X		X					X												
BES014	History of Eng Sciences			X	X		X														
BES004	English Language.					X		X	X												
BES021	Mathematics (1-B)	X							X	X											
BES022	Physics (1-B)	X	X			X			X												
PRE021	Production Engineering	X				X	X	X			X										
ELE021	Computer and Programming	X	X								X										
BES111	Mathematics (2)	X							X	X											
PRE117	Applied mechanics	X								X											
BES115	Physics (2)	X	X			X			X												
ELE111	Electrical engineering											X	X	X	X						
ELE112	Computer Applications (1)	X	X										X	X							X
ELE121	Electronics												X	X	X	X			X		
ELE122	Electrical materials											X				X				X	
ELE123	Energy Conversion										X	X				X					
MPE127	Fluid mechanics	X	X																		
MPE128	Thermodynamics	X	X																		
PRE127	Economy & projects managements	X	X				X														
BES211	Mathematics (3)	X							X	X											
ELE211	Electrical power engineering (1)																	X		X	X
ELE212	Measurements & Measuring instruments											X	X		X		X				
ELE213	Electrical circuits theory											X	X	X	X				X		
ELE214	Computer Application (2)	X	X										X	X							X
ELE221	Electrical machines (1)																X	X		X	X
ELE222	Digital electronics												X		X	X		X	X		X
ELE223	Electromagnetic field theory											X			X						
ELE224	Object Oriented Programming	X	X										X	X							X
BES311	Mathematics (4)	X							X	X											
ELE311	Electrical power engineering (2)																	X		X	X
ELE312	Electric machines (2)																X	X		X	X
ELE313	Automatic control systems																		X		X
ELE314	Power electronics														X			X	X		
ELE305	Electrical testing (1)														X		X	X	X		
ELE323	High voltage engineering																X	X			X
ELE324	Computer engineering														X				X		
ELE325	Writing Technical Reports					X		X	X	X											
ELE 411	Electrical power system analysis																				X
ELE 412	Electric machine design																	X		X	X
ELE 415	Electrical testing (2)													X	X		X	X	X		
ELE421	Electric drives																		X		X
ELE422	Power system protection																	X		X	X
ELE423	Digital control																X		X		X
ELE406	Project		X	X			X	X		X	X	X	X			X	X			X	X
MPE227A	Heat Engines	X	X																X		
MPE227B	Hydraulic Machines	X	X																X		
MPE327A	Mechanical Power Stations	X	X																X		
MPE327B	Hydraulic Systems	X	X																X		
ELE321A	New and renewable energy.	X	X								X								X		
ELE321B	Programmable logic controller and its applications.												X	X					X		X
ELE321C	Advanced programming and their applications.												X	X							X
ELE321D	Switchgear Technology																			X	X
ELE322A	Special electric machines.																	X	X	X	X
ELE322B	Optimization methods in electric power systems.																			X	X
ELE322C	Programming in Machine Languages.												X	X							X
ELE413A	Modern analysis of electric machines.																X				X
ELE413B	Analysis of faulted power systems.																			X	X
ELE413C	Data Base System													X		X					X
ELE413D	Power System Planning																			X	X
ELE413E	Digital Signal Processing																X		X		
ELE414A	Electric machine dynamics.																		X		X
ELE414B	Economic operation of electric power systems.																			X	X
ELE414C	Computer Control.																		X		X
ELE424A	Power Electronics technology.															X		X	X		
ELE424B	Control of electrical power systems.																		X	X	X
ELE424C	Application of protection systems																	X		X	X
ELE424D	Protection Transducers and Grounding																		X	X	
ELE424E	Expert Systems												X	X							X
ELE425A	Control of electric machines																		X		X
ELE425B	Power systems stability.																			X	X
ELE425C	Insulation Co-ordination																			X	X
ELE425D	Static Relay and Computer Applications to Protection																			X	X
ELE425E	Robotics																		X		X