

Benha University

Faculty of Engineering at Shoubra

Electrical Engineering Department



Internal Quality System Project

Program Specifications

Electrical Power and Machines Section

Program Specification

Benha University, Faculty of Engineering at Shoubra

The Program Specifications

A- Basic Information

1. Program Title: electrical power and machines.
2. Program Type: single.
3. Department: electrical engineering.
4. Co-ordinator: Prof. Dr. Sayed A. Ward.
5. External Reviewer: Prof. Dr Abdelmaqsoud Ibrahim Ta'lab.
6. Date of Approval of Specification: by faculty committee in 20/ 6/ 2010.

B- Professional Information

1. Program Objectives:

1. To prepare undergraduate students who will be able to create new ways to meet society's needs through the applications of fundamentals of engineering sciences to practical problems using design, analyses and syntheses of electrical components, circuits, and systems. Thus, becoming successful engineering problems solvers, life long learners, innovators, and professionals in the field of electrical power and machines.
2. 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.
3. To prepare engineers who will be able to work on electrical power and machines systems including the design and realization of such systems.
4. To insure that students are exposed to elements of social sciences, humanities and environmental studies so that they understand the necessities for professionalism, ethical responsibilities and the needs to function in multidisciplinary teams.
5. To prepare students to express themselves effectively in both oral and written communication.
6. To prepare students for engineering analyses and problem solving using appropriate mathematical and computational methodologies.

7. To teach students to use experimental and data analysis techniques for electrical power and machines engineering applications.
8. To provide 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.
9. To provide various industries by highly qualified electrical power and machines engineers who have a broad knowledge of electrical engineering and related principles, theories and applications.

2. The Attributes of Electrical Engineer

The electrical power and machines engineer should be able to:

- 1- Apply knowledge of mathematics, science and engineering concepts to the solution of complex engineering problems
- 2- Design a system, component, or process to meet 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 modern engineering tools necessary for engineering practice
- 6- Work efficiently 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 electric 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 review 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
- 16- Perform reviews of supplier documentation for compliance with specifications
- 17- Develop load lists
- 18- Develop low voltage power systems

3. Course Educational Intended Learning Outcomes:

According to the National Academic Reference Standard, the program of electrical power and machines must satisfy the following Learning Outcomes:

A- Knowledge and Understanding

The student should be able to:

- a.1) Recognize the concepts and theories of mathematics and sciences, appropriate to the Electric Power and Machines.
- a.2) Describe the basics of information and communication technology (ICT).
- a.3) Define characteristics of engineering materials related to Electric Power and Machines.
- a.4) Identify the principles of design including elements design, process and/or a system related to specific Electric Power and Machines.
- a.5) Describe the different methodologies of solving engineering problems, data collection interpretation.
- a.6) Define quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.
- a.7) Recognize business and management principles relevant to engineering.
- a.8) Discover current engineering technologies as related to Electric Power and Machines.
- a.9) Identify topics related to humanitarian interests and moral issues
- a.10) Recognize technical language and report writing.

- a.11) Link between professional ethics and impacts of engineering solutions on society and environment.
- a.12) Identify contemporary engineering topics
- a.13) Illustrate analytical and computer methods appropriate for electrical power and machines engineering.
- a.14) Recognize the design methods and tools for electrical power and machines equipment and systems.
- a.15) Describe the principles of operation and performance specifications of electrical and electromechanical engineering systems.
- a.16) Define fundamentals of engineering management.
- a.17) Explain basic electrical power system theory.
- a.18) Describe theories and techniques for calculating short circuit, motor starting and voltage drop.
- a.19) Mention diverse applications of electrical equipment.
- a.20) Describe logic circuits.
- a.21) Illustrate basic power system design concepts for underground, cable tray, grounding and lighting systems.
- a.22) Describe the basics of low voltage power systems.
- a.23) Illustrate principles of performing electrical systems calculations, including load flow, earthing and equipment sizing.

B- Intellectual Skills

The students should be able to

- b.1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
- b.2) Select appropriate solutions for engineering problems based on analytical thinking
- b.3) Think in a creative and innovative way in problem solving and design.
- b.4) Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
- b.5) Assess and evaluate the characteristics and performance of components, systems and processes.
- b.6) Investigate the failure of components, systems, and processes
- b.7) Solve engineering problems, often on the basis of limited and possibly contradicting information.
- b.8) Select and appraise appropriate ICT tools to a variety of engineering problems.
- b.9) Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
- b.10) Incorporate economic, social, environmental dimensions and risk management in design.
- b.11) Analyze results of numerical models and appreciate their limitations.
- b.12) Create systematic and methodic approaches when dealing with new and advancing technology.
- b.13) Identify and formulate engineering problems to solve problems in the field of electrical power and machines engineering.

- b.14) Analyze design problems and interpret numerical data and test and examine components, equipment and systems of electrical power and machines.
- b.15) Integrate electrical, electronic and mechanical components and equipment with transducer, actuators and controllers in creatively computer controlled systems.
- b.16) Analyze the performance of electrical power generation, control and distribution systems.

C- Professional and Practical Skills

The students should be able to

- c.1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
- c.2) Professionally merge the engineering knowledge, understanding, and feedback to improve design, product and/or services.
- c.3) Create and/or re-design a process, component or system, and carry out specialized engineering designs.
- c.4) Practice the neatness and aesthetics in design and approach.
- c.5) Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.
- c.6) Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer
- c.7) Apply numerical modeling methods to engineering problems.
- c.8) Apply safe systems at work and observe the appropriate steps to manage risks.
- c.9) Demonstrate basic organizational and project management skills.
- c.10) Apply quality assurance procedures and follow codes and standards.
- c.11) Exchange knowledge and skills with engineering community and industry.
- c.12) Prepare and present technical reports.
- c.13) Design and perform experiments, as well as analyze and interpret experimental results related to electrical power and machines systems.
- c.14) Test and examine components, equipment and systems of electrical power and machines.
- c.15) Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.
- c.16) Specify and evaluate manufacturing of components and equipment related to electrical power and machines.
 - c.17) Apply modern techniques, skills and engineering tools to electrical power and machines engineering systems

D- General and Transferable Skills

The students should be able to

- d.1) Collaborate effectively within multidisciplinary team.
- d.2) Work in stressful environment and within constraints.
- d.3) Communicate effectively.
- d.4) Demonstrate efficient IT capabilities.

- d.5) Lead and motivate individuals.
- d.6) Effectively manage tasks, time, and resources.
- d.7) Search for information and engage in life-long self learning Electric Power and Machines.
- d.8) Acquire entrepreneurial skills.
- d.9) Refer to relevant literatures.

4. Academic Standards:

The National Academic References Standards (NARS) are adopted in designing the current program.

5. Program Skelton structure and Contents:

5-A) Program duration: 5 years (10 semesters).

5-B) Program Skelton ...

5-B-1) Week hours: 238+60 hr. for preparatory. Year ,131 lectures, 107 lab/tutorials, total 238.

5-B-2) Equivalent hours: 177.5+45.5 for pre. Year, obligatory 162.5, elective 15.

5-B-3) Equivalent hours for basic science: 54.5, 30.5%

5-B-4) Equivalent hours for social/humanities science 24,13.5%

5-B-5) Equivalent hours for specialized courses: 99, 56%

5-B-6) Equivalent hours for other courses.--

5-B-7) External training: three weeks in summer vacation at the end of the academic year.

CHARACTERIZATION FOR ENGINEERING DISCIPLINES by Subject Area:

CHARACTERIZATION FOR ENGINEERING DISCIPLINES by Subject Area

Code	Course name	A	B	C	D	E	F	G
EMP 001	Mathematics (A)		1					
EMP 012	Mechanics		1					
EMP 013	Physics (A)		1					
EMP 014	Chemistry		1					
MDE 001	Engineering drawing and isometric			1				
GEN 001	Technical language	1						
EMP 021	Mathematics (B)		1					
EMP 012	Mechanics		1					
EMP 023	Physics (B)		1					
MDE 001	Engineering drawing and isometric			1				
MDE 002	Engineering production		1					
GEN 002	History of engineering science							1

EPE 111	Principles of Electrical Engineering				1				
EPE 112	Tests (1)							1	
EPE 113	Electrical Properties of Materials				1				
EMP 171	Mathematics (2)(A)			1					
EMP 172	Physics			1					
GEN 171	Language (2)	1							
EPE 121	Tests (2)							1	
EPE 170	Electronics (1)				1				
ECE 171	Computer Programming						1		
MPE 170	Mechanical Engineering				1				
EMP 173	Mathematics (2)(B)			1					
GEN 173	Engineering Legislation	1							
EPE 211	Electric Circuit				1				
EPE 212	Electromagnetic Fields				1				
EPE 213	Measuring Instruments	1							
MDE 271	Mechanical Engineering (2)				1				
EMP 271	Mathematics (3)(A)			1					
GEN 271	Technical Reports Writing	1							
EPE 221	Tests (3)							1	
EPE 222	Electrical Machines					1			
EPE 223	Electrical power Engineering				1				
ECE 270	Electronic and Logic Circuits				1				
EMP 272	Mathematics (3)(B)			1					
GEN 272	Project Managements	1							
EPE 311	Transmission & Distribution of Electrical power				1				
EPE 312	Electrical Machines (2)					1			
EPE 313	Power Electronics (1)				1				
EPE 314	Automatic Control (1)				1				
EPE 315	Tests (4)								1
GEN 371	Economics of Electrical Energy Utilization								1
EPE 321	Switchgear and Protection					1			
EPE 322	Analysis and design of Electric Machines					1			
EPE 323	Tests (5)							1	
EPE 324	Computer Applications in Electrical power and Machines						1		
EPE 325	High Voltage Engineering					1			
GEN 371	Economic and Management	1							
GEN 375	Projects Feasibility Study	1							
EPE 411	Power Electronics (2)					1			
EPE 412	Automatic Control (2)				1				
EPE 413	Tests and Specifications (A)							1	
EPE 414	Project*							1	
EPE 415	High Voltage Engineering					1			
EPE 441	Power Electronics					1			
EPE 442	Electrical Drive Systems (1)					1			
EPE 444	Analysis of Electrical Power Systems					1			
EPE 446	Numerical Analysis of Electromagnetic Fields (1)						1		
EPE 443	Computer Applications in High Voltage Engineering						1		
EPE 445	Circuit Breakers and Substation					1			
EPE 447	Computer Applications in Power and Networks System						1		
EPE 421	Utilization of Electrical Energy								1
EPE 422	Tests and Specifications (B)							1	
EPE 414	Project							1	
GEN 470	Environmental Impacts of Electrical Energy								1
EPE 448	Applications of Power Electronics					1			
EPE 449	Electrical Drive Systems (2)					1			
EPE 450	Control of Electrical Machines					1			
EPE 451	Advanced Study in High Voltage Engineering					1			
EPE 452	Load Forecasting in Electrical Power Systems					1			
EPE 453	Dynamic Modeling of Power Systems						1		
EPE 454	Advanced Study in Electrical Power System Analysis						1		
QTY		7	14	15	16	7	8	5	
Percentage		10	19	21	22	10	11	7	
NARS Percentage		11	21	21	21	10	9	7	

	Subject Area	Percentage	NARS %	Tolerance
A	Humanities and Social Sciences (Univ. Req.)	11	10	9-12 %
B	Mathematics and Basics Sciences	21	19	20-26 %
C	Basic Engineering Sciences (faculty/Specs. Req.)	21	21	20-23 %
D	Applied Engineering and Design	21	22	20-22 %
E	Computer Applications and ICT	10	10	9-11 %
F	Projects and Practice	9	11	8-10 %
	Subtotal	93	93	92-94 %
G	discretionary (Institution Character-Identifying) Subjects	7	7	6-8 %
	Total	100	100	100%

No	Code	Subject name	No. of hours per week				Equiv. hours	year	term	Objective ILOs
			Lec.	Tut.	Prac.	Tot.				
1	EMP 001	Mathematics (A)	4	2	-	6	5	Prep.	1 st	See Matrix
2	EMP 012	Mechanics	2	2	-	4	3			
3	EMP 013	Physics (A)	4	1	2	7	5.5			
4	EMP 014	Chemistry	4	-	2	6	5			
5	MDP 001	Engineering drawing and isometric	1	4	-	5	3			
6	GEN 001	Technical language	-	2	-	2	1			
		Total	15	11	4	30	22.5			
1	EMP 021	Mathematics (B)	4	2	-	6	5	Prep.	2 nd	See Matrix
2	EMP 012	Mechanics	2	2	-	4	3			
3	EMP 023	Physics (B)	4	-	2	6	5			
4	MDP 001	Engineering drawing and isometric	-	4	-	4	2			
5	ECE 006	Computer science	2	1	-	3	2.5			
6	MDP 002	Engineering production	2	-	3	5	3.5			
7	GEN 002	History of engineering science	2	-	-	2	2			
		Total	16	9	5	30	23			

No	Code	Subject name	No. of hours per week			Equiv. hours	year	term	Objective ILOs
			Lec.	Tut./Prac.	Tot.				
1	EPE 111	Principles of Electrical Engineering	4	2	6	5	1 st	1 st	See Matrix
2	EPE 112	Tests (1)	-	4	4	2			
3	EPE 113	Electrical Properties of Materials	4	2	6	5			
4	EMP 171	Mathematics(2)(A)	4	2	6	5			
5	EMP 172	Physics	4	2	6	5			
6	GEN 171	Language(2)	-	2	2	1			
		Total	16	14	30	23			
1	EPE 121	Tests (2)	-	4	4	2	1 st	2 nd	See Matrix
2	ECE 170	Electronics (1)	4	2	6	5			
3	ECE 171	Computer programming	2	2	2	3			
4	MPE 170	Mechanical engineering	4	2	6	5			
5	EMP 173	Mathematics (2)(B)	4	2	6	5			
6	GEN 173	Engineering Legislation	4	-	4	4			
		Total	18	12	30	24			

No	Code	Subject name	No. of hours per week			Equiv. hours	year	term	Objective ILOs
			Lec.	Tut./Prac.	Tot.				
1	EPE 211	Electrical circuits	4	2	6	5	2 nd	1 st	See Matrix
2	EPE 212	Electromagnetic Fields	3	2	5	4			
3	EPE 213	Measuring Instruments	4	2	6	5			
4	MDE 271	Mechanical engineering (2)	4	2	6	5			
5	EMP 271	Mathematics (3)(A)	3	2	5	4			
6	GEN 271	Technical Reports Writing	-	2	2	1			
		Total	18	12	30	19			
1	EPE 221	Tests (3)	-	4	4	2	2 nd	2 nd	See Matrix
2	EPE 222	Electrical Machines	4	2	6	5			
3	EPE 223	Electrical Power Engineering	4	2	6	5			
4	ECE 270	Electronic and Logic Circuits	3	2	5	4			
5	EMP 272	Mathematics (3)(B)	3	2	5	4			
6	GEN 272	Project managements	3	1	4	3.5			
		Total	17	13	30	23.5			

No	Code	Subject name	No. of hours per week			Equiv. hours	year	term	Objective ILOs
			Lec.	Tut./Prac.	Tot.				
1	EPE 311	Transmission & Distribution of Electrical Power	3	2	5	4	3 rd	1 st	See Matrix
2	EPE 312	Electrical machines (2)	4	2	6	5			
3	EPE 313	Power electronics (1)	4	2	6	5			
4	EPE 314	Automatic control (1)	3	2	5	4			
5	EPE 315	Tests (4)	-	4	4	2			
6	GEN 370	Economics of Electrical Energy Utilization	3	1	4	3.5			
		Total	17	13	30	21.5			
1	EPE 321	Switchgear and Protection	4	2	6	5	3 rd	2 nd	See Matrix
2	EPE 322	Analysis and Design of Electrical Machines	4	2	6	5			
3	EPE 323	Tests (5)	-	4	4	2			
4	EPE 324	Computer Applications in Electrical Power and Machines	4	2	6	5			
5	EPE 325	High Voltage Engineering (1)	4	2	6	5			
6	GEN 37x	Elective Course of Humanities	2	-	2	2			
		Total	18	12	30	24			

No	Code	Subject name	No. of hours per week			Equiv. hours	year	term	Objective ILOs
			Lec.	Tut./Prac.	Tot.				
1	EPE 411	Power Electronics(2)	4	2	6	5	4 th	1 st	See Matrix
2	EPE 412	Automatic control (2)	3	2	5	4			
3	EPE 413	Tests and Specifications (A)	1	3	4	2.5			
4	EPE 414	Project	-	4	4	2			
5	EPE 415	High Voltage Engineering (2)	3	2	5	4			
6	EPE 44x	Elective course (1) from first list	2	2	4	3			
7	EPE 44x	Elective course (2) from second list	2	2	4	3			
		Total	15	17	32	23.5			
2	EPE 421	Utilization of Electrical Energy	4	2	6	6	4 th	2 nd	See Matrix
3	EPE 422	Tests and Specifications (B)	1	3	4	2.5			
4	EPE 414	Project	-	6	6	3			
5	EPE 44x	Elective course (3) from third list	2	2	4	3			
6	EPE 44x	Elective course (4) from fourth list	2	2	4	3			
	GEN 470	Environmental Impacts of Electrical Energy	3	1	4	3.5			
		Total	12	16	28	20			

Elective Courses

No	Code	Subject name	No. of hours per week			Equip. hours	year	term	Objective ILOs
			Lec.	Tut.	Tot.				
1	EPE 441	Power electronics (3)	2	2	4	3	List #1	See Matrix	
2	EPE 442	Electrical Drive Systems (1)	2	2	4	3			
		Total	4	4	8	6			
1	EPE 443	Computer Applications in High Voltage Engineering	2	2	4	3	List #2	See Matrix	
2	EPE 444	Analysis of Electrical Power Systems	2	2	4	3			
3	EPE 445	Circuit Breakers and Substation	2	2	4	3			
4	EPE 446	Numerical Analysis of Electromagnetic Fields (1)	2	2	4	3			
5	EPE 447	Computer Applications in Power and Networks Engineering	2	2	4	3			
		Total	12	12	24	18		See Matrix	
1	EPE 448	Applications of Power Electronics	2	2	4	3	List #3	See Matrix	
2	EPE 449	Electrical Drive Systems (2)	2	2	4	3			
		Total	4	4	8	6			

No	Code	Subject name	No. of hours per week			Equiv. hours	year	term	Objective ILOs
			Lec.	Tut.	Tot.				
1	EPE 451	Advanced Study in High Voltage Engineering	2	2	4	3	List #4	See Matrix	
2	EPE 452	Load Forecasting in Electrical Power Systems	2	2	4	3			
3	EPE 453	Dynamic Modeling of Power Systems	2	2	4	3			
4	EPE 454	Advanced Study in Electrical Power System Analysis	2	2	4	3			
Total			8	8	16	12			

1	GEN 371	Economics and Management	2	-	2	2	Humanities	See Matrix
2	GEN 375	Projects Feasibility Studies	2	-	2	2		
Total			4	-	4	4		

6. Progress Requirement:

Success in all courses or with one or two corrective courses.

7. Entry Requirement:

Subject for success in prep. Year based on the choices and marks.

8. Educational Results Evaluation:

Evaluator	Tool	Sample
End of term students	Questionnaire at the end of each semester	All students
Graduates	Questionnaire before project discussion	fourth year students.

Beneficiary	Questionnaire, seminars and annual employment conference	-----
External Reviewer	Reviewing all document for program and courses specification and reports	All documents