Program Specification

For

Master of Science Degree

in

Electrical Power and Machines Engineering

First

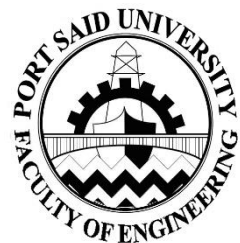# Program Specification

Program Specification
For
Master of Science Degree in
Electrical Power and Machines Engineering

A- Basic Information

1- **Program title: MS.c in Electrical Power and Machines Engineering.**

2- **Program type: Single** √   **Double** ☐   **Multiple** ☐

3- **Department (s): Electrical Engineering (Electrical Power Engineering section)**

4- **Assistance Coordinator: Dr. Azza Desouki**

5- **Coordinator: The Head of the Department**

6- **External evaluator(s): NA**

7- **Last date of program specifications approval: Bylaw 2000.**

B- Professional Information

1- Introduction:

Electrical Power And Machines Engineering is constantly widening its scope in every field of engineering. The prime work of the Electrical Power And Machines Engineer is to design, fabricate, produce, test and supervise the manufacturing of electrical products for various industries. This postgraduate master program in Electrical Power And Machines Engineer supports the graduate students with high-quality level of theoretical knowledge and research skills to enable them add value in their professional practice and furthermore. Also, for the post graduate students who works as a demonstrators to be professional in doing researches in various fields of Electrical Power And Machines Engineer Engineering and transforms them to high-quality technical professionals and research scholars who can meet the requisite requirement of educational institutes, R&D organizations, and Electrical Power And Machines industry.

2- Graduate Attributes :

After completing the program the graduate would able to be:

A. Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools to serve professional practice in the field of Electrical Power And Machines Engineer.

B. Apply the analytical approach and using it in the field of Electrical Power And Machines Engineer, as well as the topics that affect his/her professional practice.

C. Apply the specialized knowledge integrated with and the use of appropriate engineering tools, such as, computational facilities, laboratory equipment, necessary for his / her professional practice and project management.

D. specialized engineering concepts related to his / her professional practice in the fild of Electrical Power And Machines Engineer

E. Show awareness of current problems and modern visions in in the field of Electrical Power And Machines Engineer.

F. Identify professional problems and find solutions for it.

G. Mastery of an appropriate range of specialized professional and intellectual skills and the use of appropriate technology means to carry out a research study, writing a scientific methodology plain. add new information to the knowledge and write scientific paper.

H. Communicate effectively and lead team works effectively.

I. Take good decisions in different professional contexts

J. Employ available resources to achieve and maintain the highest benefit

K. Show awareness of his / her role in community development and environmental conservation in the light of the global and regional variables

L. Display professional responsibilities and ethical, societal and cultural concerns.

M. Recognize the need to engage to develop him / her academically and being able to learn continuously in the field of Electrical Power And Machines Engineer.

3- Program Aims:

This Program is designed to give you the ability to:

The graduate of the Master program must be able to:

1. Gain a depth of knowledge, understanding and methodologies of scientific research including professional skills, pertinent software and appropriate technological means to make decisions, employ available resources efficiently, develop new skills to deal with a high level complex problems, and engage in continuous learning practice in the field of Electrical Power And Machines Engineer

2. Demonstrate sufficient essential knowledge and a deep understanding of concepts, theories, and practice in the field of Electrical Power And Machines Engineer, as well as the topics that affect his/her professional practice.

3. Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing Electrical Power And Machines problems.

4. Communicate and lead team works effectively through professional system considering the detrimental impact of the engineer role on society, environment, societal and cultural concerns.

5. Demonstrate knowledge of contemporary, current, and advanced engineering issues related to Electrical Power And Machines engineering problems.

6. Adopt basics and principles of quality and fundamentals of ethical & legal professional practice of scientific research in the field of Electrical Power And Machines engineering.

7. Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.

4- Graduate Attributes with Program Aims:

Program Aims	Graduates Attributes
1. Gain a depth of knowledge, understanding and methodologies of scientific research including professional skills, pertinent software and appropriate technological means to make decisions, employ available resources efficiently, develop new skills to deal with a high level complex problems, and engage in continuous learning practice in the field of Electrical Power And Machines Engineer	A, G, I, and K
2. Demonstrate sufficient essential knowledge and a deep understanding of concepts, theories, and practice in the field of Electrical Power And Machines engineering, as well as the topics that affect his/her professional practice.	C, D, and G
3. Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, designing, and analyze risks of the professional practice in Electrical Power And Machines Engineering.	B, E, F, and G
4. Communicate and lead team works effectively through professional system considering the detrimental impact of the engineer role on society, environment, societal and cultural concerns.	H, I, J, K, and L
5. Demonstrate knowledge of contemporary, current, and advanced engineering issues related to Electrical Power And Machines engineering problems.	G, E, and M
6. Adopt basics and principles of quality and fundamentals of ethical & legal professional practice of scientific research in the field of Electrical Power And Machines Engineering.	L
7. Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	G

Electrical Power And Machines Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program Intended Learning Outcomes (ILOs)	Program Objectives
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering.	**2**
	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	**2**
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	**4**
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	**5**
A4- Fundamentals of ethical & legal professional practice in the field of specialization.	A4-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field of Electrical Power And Machines Engineering.	**6**
A5- Basics and principles of quality in professional practice in the field of specialization.	A5-1 Explain quality assurance concepts of different Electrical Power And Machines components and systems development phases.	6
A6- Basics and ethics of scientific research.	A6-1 Recognize basics and ethics of scientific research.	1, 4
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	1, 3
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	3

B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	3
B4- Conduct a research study and/or writing systematic scientific study on Research problem.	B4-1 Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	7
B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering	3
B6- Plan to imporove performance in the field of of specialization.	B6-1 Plan to improve performance in the field of Electrical Power And Machines Engineering.	5
B7- Take professional decisions in different professional practical contexts.	B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development Electrical Power And Machines systems.	1
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	3
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	7
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	3
D1- Communicate effectively in different aspects.	D1-1 Express professional and communication skills effectively in different aspects.	4
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	2
D3- Adopt self-assessment and specify the needs of personal learning.	D3-1 Apply self evaluation and specify his educational needs related to Electrical Power And Machines aspects.	4, 6
D4- Establish rules and indicators for assessing the performance of others.	D4-1 Design standards to evaluate others performance.	4, 6
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	2
D6- Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	4

D7- Demonstrate a high level of competence in the time management.	D7-1Demonstrate a high level of competence in the time management.	1, 4
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	1

6- Program Academic Reference Standards (ARS)

This program fulfills the Academic Reference Standards (ARS) guidelines of March 2009 for postgraduate programs prepared by the National Authority for Quality Assurance and Accreditation (NAQAAE) on 2009 - Supreme Council of Universities in Egypt.

7- Program Structure and Contents:

7.1 Program Duration: a minimum of 2 years & a maximum of 5 years (including one year of preparatory courses)

7.2 Program Structure: Awarding a Master Degree in Electrical Power And Machines Sciences required the study of courses amounting to 18 hours weekly for one academic year. Nine (9) hours of them are devoted to department basic requirements. The other nine (9) hours constitute specialized courses are selected by the supervision team and approved by the department council. These courses are chosen from among the 600 – level and are directly related to the topic of his research. Also, required for awarding the Master Degree in Electrical Power And Machines Sciences is the execution of scientific research that terminated by writing a thesis containing the research results and its complete analysis and defending it successfully. In rare cases the student can select courses of the 500 - level according to their research topics. In such cases the specifications of these courses will be done.

7.3 Program Contents (Courses):

➢ **Department Basic Requirements Courses:**

Course Code	Course Title	Course Hours/Week	Marks Written Exam
SCI 603	Higher Mathematic	3	100
CCE 616	Advanced Programming Language	3	100
ECE 61X	Elective Course	3	100
Elective Course**			
EPM522	Switchgear & Protection Equipment	3	100
EPM 603	Analysis of Electrical Power Systems	3	100

** Select only one course.

➢ **Specialized Requirements Courses***:**

Course Code	Course Title	Course Hours/Week	Marks Written Exam
EPM 601	Electrical Testing and Measurements (2)	3	100
EPM 602	Theories and Analysis of Electrical Machines (2)	3	100
EPM 604	High and Extra-High Voltage Engineering	3	100
EPM 605	Control of Power Systems	3	100
EPM 606	Power Electronics Systems	3	100
EPM 607	Microprocessor Applications in Electric Power and Machines (2)	3	100
EPM 608	Electromagnetics	3	100
EPM 609	Transients in Linear Systems	3	100
EPM 610	Design of Electrical Machines (2)	3	100
EPM 611	Control Systems of Electrical Machines	3	100
EPM 612	Operation of Power Systems	3	100
EPM 613	Electrical Networks (2)	3	100
EPM 614	Electrical Materials	3	100
EPM 615	Protection of Electric Power Systems (2)	3	100
EPM 616	Design of Power Electronic Circuits	3	100
EPM 617	Power Generation from Renewable Sources (2)	3	100
EPM 618	Electrical Drive (2)	3	100
EPM 622	Selected Topics in Electrical Power and Machines	3	100

*** Select only three courses related to the research topic. In rare cases the student can select courses of 500 - level according to their research topics. In such cases the specifications of these courses will be offered.

8- Program Matrix:

The following table explains the ILO's (of the current program) – Course (main ILOs) matrix.

Program Matrix: ILO's (of the current program) – Course (main ILOs) matrix.

Courses Codes	EPM																						SCI	CCE	Thesis
	519	520	522	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	622	603	616	
ILOs																									
a1-1			x						x	x							x		x		x	x	x	x	
a1-2	x	x		x	x	x	x	x			x	x		X	X	x			x	X	x				X
a2-1	x		x	x	x	x	x				x	x			X	x	x				x	x			X
a3-1	x		x				x			x	x	x			X	x	x		x						X
a4-1									x			x					x		x						X
a5-1	x								x									x							X
a6-1									x				x						x						X
b1-1	x		x	x	x	x	x	x		x	x	x		X	X	x				X	x		x	X	X
b2-1	x	x		x	x		x			x		x	x					x		X		x			X
b3-1	x		x	x			x					x		X	X	x			x		x				X
b4-1												x						x							X
b5-1	x		x	x			x				x	x							x						X
b6-1									x				x						x						X
b7-1	x								x								x	x							X
c1-1	x	x	x	x	X	x	x	x		x	x	x		X	X	x				X	x	X		X	X
c2-1	x		x	x			x				x			X	X	x					x	x		X	X
c3-1		x			X	x		x					x	X					x	X	x				X
d1-1									x			x						x							X
d2-1	x		x	x			x				x						x	x						X	X
d3-1									x								x								X
d4-1		x		x								x						x		X					X
d5-1	x		x		x	X	x	x		x	x			X	X	x			x		x			X	X
d6-1									x			x	x					x				X			X
d7-1									x								x								X
d8-1	x		x				x		x		x	x			X	x			x		X			X	X

9- Program admission requirements

The applicant to the Master of Science program in Electrical Power and Machines Engineering must hold a B.Sc. in Electrical Engineering (Specialized in Electrical Power and Machines Engineering) with a minimum grade of "Good" (which is equivalent to cumulative grade of 65%) from a recognized university in Egypt or an equivalent degree recognized by the supreme council of universities.

10- Methods and rules of evaluating students for the preparatory year

- Written examinations for the preparatory year after 30 weeks.

11-   The regulations for starting the registration of the master thesis

The student must pass all the preparatory year's courses with at least pass grade (60%) in each course and pass the seminar and oral discussion in the thesis research topic which accomplished in the academic department.

12-   The regulations for granting the degree of Master of Science for the student

- The student is required to do a seminar about his thesis and has to be approved by the academic department.

- The student is required to publish at least one scientific paper from the thesis in specialized journal or conference.

- The thesis is required to be approved by an examiners committee suggested by the academic department and approved by the faculty council (including at least one external examiner). The evaluation of the thesis and the discussion is carried out in an open session.

Program Coordination Committee:

Program coordinator: **Dr. Azza Ahmed Dessouki**

Head of the Department: **Prof. Dr. Samir Mohamed Elmakkawy**

Date: / /2019.

Second

Courses Specifications

EPM 519
High voltage direct current
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	M.Sc.
Date of specification approval	*August 2019*

A- Basic Information

Title: HVDC Transmission systems	Code Symbol: **EPM 519**	
Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in HVDC Transmission systems . This course provides the background in HVDC Transmission systems , help students meet the demand of growing HVDC Transmission systems and prepares them to advanced study and research in the HVDC Transmission systems and to be familiar with recent trends in HVDC Transmission systems . The covered topics relate to: DC power transmission technology, analysis of HVDC converters, HVDC converters controls, power flow analysis in AC/DC systems, Transient and dynamic stability and Harmonic and torsional interactions. The main Objectives of this course are to equip the students with:

1. Knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to HVDC Transmission systems .
2. Advanced skills in the definition, physics, analysis, and solving of problems related to HVDC Transmission systems .
3. The ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using HVDC Transmission systems and devices.
4. The ability to deal effectively with the skills that necessary to identify and solve complex and open ended engineering problems related to HVDC Transmission components and subsystems design and implementation.
5. Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools in the area of HVDC Transmission systems .
6. Application of specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of HVDC Transmission systems

2- Intended Learning Outcomes (ILOs) for the whole program

HVDC Transmission Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic **DC power transmission technology**. a1-2-2 Classify the basic comparison and application of AC and DC transmission. a1-2-3 Classify and analysis of HVDC converters and according to their physical structure and properties. a1-2-4 Demonstrate sufficient essential knowledge and a deep understanding to the principles of DC link control. a1-2-5 Describe different HVDC converters effective techniques and methods to analyze different types of converters for HVDC transmission. a1-2-6 Demonstrate sufficient essential knowledge and a deep understanding to the principles of power flow analysis in AC/DC systems. a1-2-7 Explain the theory of transient stability analysis with emphasis on effects of converter model and controller properties, and applications. a1-2-8 Demonstrate a basic understanding of the harmonics and filters.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss harmonic interaction with HVDC systems.

A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Classify the Potential applications of HVDC generation and transmission.
A5- Basics and principles of quality in professional practice in the field of specialization.	A5-1 Explain quality assurance concepts of different Electrical Power And Machines components and systems development phases.	a5-1-1 Explain Quality Assurance concepts of different component models of filters and reactive power controllers .
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to HVDC generation and transmission.
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	b2-1-1 identify and apply appropriate methods for discrimination of physics-based optical device models in the context of specific technological constraints . b2-1-2 Select the most appropriate model of an reactive power controller component to perform analysis and search for optimized solutions.
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to HVDC generation and transmission and its applications.
B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering	b5-1-1 Evaluate pros and cons of given methodologies for HVDC generation and transmission and its applications systems development.
B7- Take professional	B7-1 Acquire decision	b7-1-1 Present, evaluate, and interpret qualitative

decisions in different professional practical contexts.	making capabilities in different situation when facing problems related to analysis, design and development Electrical Power And Machines systems.	and quantitative data concern with HVDC generation and transmission and its applications system, to develop lines of argument and make sound judgments in accordance with their basic theories and concepts.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to HVDC generation and transmission and its applications, using latest engineering techniques, skills, and tools. c1-1-2 Use tools, techniques, equipment and software relevant to HVDC generation and transmission and its applications
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	c2-1-1 Write and evaluate a professional report on HVDC generation and transmission and its applications
D. General and transferrable skills		
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to HVDC generation and transmission and its applications.
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge HVDC generation and transmission and its applications systems.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about HVDC generation and transmission and its applications.

3- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Dc Power Transmission Technology.	18	18	--
2- Analysis of HVDC Converters.	12	12	--

3- Principles Converter and HVDC System Control.	12	12	--
4- Reactive Power Control.	12	12	--
5- Harmonic and Filters	12	12	--
6- Power Flow Analysis in AC/DC systems.	12	12	--
7- Digital Dynamic Simulation of Converters and DC Systems	6	6	--
Total	**84**	**84**	**--**

4- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	**A1 (a1-2), A2 (a2-1), A3 (a3-1), A5 (a5-1)**	**B1 (b1-1), B2 (b2-1), B3 (b3-1), B5 (b5-1), B7 (b7-1)**	**C1 (c1-1), C2 (c2-1)**	**D2 (d2-1), D5 (d5-1), D8 (d8-1)**

5- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**	**-**		**100%**

6- Course Topics.

Topic No.	Topic	Weeks
1st	1- Dc Power Transmission Technology.	1-6
2nd	2- Analysis of HVDC Converters.	7-10
3rd	3- Principles Converter and HVDC System Control.	11-14
4th	4- Reactive Power Control.	15-18
5th	5- Harmonic and Filters	19-22
6th	6- Power Flow Analysis in AC/DC systems.	23-26
7th	7- Digital Dynamic Simulation of Converters and DC Systems	27-28

7- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic **DC power transmission technology**. a1-2-2 Classify the basic comparison and application of AC and DC transmission. a1-2-3 Classify and analysis of HVDC converters and according to their physical structure and properties. a1-2-4 Demonstrate sufficient essential knowledge and a deep understanding to the principles of DC link control. a1-5-5 Describe different HVDC converters effective techniques and methods to analyze different types of converters for HVDC transmission. a1-2-6 Demonstrate sufficient essential knowledge and a deep understanding to the principles of power flow analysis in AC/DC systems. a1-2-7 Explain the theory of transient stability analysis with emphasis on effects of converter model and controller properties, and applications. a1-2-8 Demonstrate a basic understanding of the harmonics and filters.	X						
a2-1-1 Report and discuss harmonic interaction with HVDC systems.	X	X					
a3-1-1 Classify the Potential applications of HVDC generation and transmission.			X				
a5-1-1 Explain Quality Assurance concepts of different component models of filters and reactive power controllers .						X	
Course ILOs	**Intellectual Skills**						
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to HVDC generation and transmission.	X	X	X	X	X	X	X
b2-1-1 identify and apply appropriate methods for discrimination of physics-based optical device models in the context of specific technological constraints . b2-1-2 Select the most appropriate model of an reactive power controller component to perform analysis and search for optimized solutions.					X	X	X
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to HVDC generation and transmission and its applications.				X		X	X

Course ILOs												
b5-1-1 Evaluate pros and cons of given methodologies for HVDC generation and transmission and its applications systems development.							X			X		X
b7-1-1 Present, evaluate, and interpret qualitative and quantitative data concern with HVDC generation and transmission and its applications system, to develop lines of argument and make sound judgments in accordance with their basic theories and concepts.							X			X		X
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to HVDC generation and transmission and its applications, using latest engineering techniques, skills, and tools. C2-1-1 Use tools, techniques, equipment and software relevant to HVDC generation and transmission and its applications				X								X

Course ILOs	General Skills											
d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to HVDC generation and transmission and its applications.							X			X		
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge HVDC generation and transmission and its applications systems.												X
d8-1-1 Exhibit the ability to learn more about HVDC generation and transmission and its applications.												X

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a1-2-6	x			x	x								
	a1-2-7	x			x	x								
	a1-2-8	x			x	x								
	a2-1-1		x	x					x	x				

Category	Code	1	2	3	4	5	6	7	8	9	10	11
	a3-1-1		x	x				x	x			
	a5-1-1							x		x		
Intellectual Skills	b1-1-1				x	x						
	b2-1-1				x	x						
	b3-1-1				x	x						
	b5-1-1				x	x			x			
	b7-1-1				x	x						
Professional Skills	c1-1-1				x	x						
	c2-1-1		x	x				x				
General Skills	d2-1-1											x
	d5-1-1		x						x			
	d8-1-1		x						x			

9- Assessment

9.1 Assessment Methods

Final Written Examination   :   to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

10- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage:

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:
Lecture notes.
Essential Books (Text Books):
- K. R.Padiyar ., "HVDC Power Transmission Systems Technology and System Interactions", John Wiley&Sons.1995

Recommended Books:
- K. R.Padiyar ., "HVDC Power Transmission Systems Technology and System Interactions", John Wiley&Sons.1995

Course Coordinator: :   Dr. Gamal Abdelazeem, Dr Attia El Sadawi

Program Coordinator: Dr. Azza Ahmed Dessouki

Head of the Department: Prof. Dr. Samir Mohamed ElMakkawy

Date: / /2019

(EPM520)
Switchgear and Protection Engineering
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M.Sc.**
Date of specification approval	***August 2019***

A- Basic Information

Title: Switchgear and Protection	Code Symbol: EPM520	
Lecture	3 hours	
Tutorial	-----	
Laboratory	-----	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims

The aims of this course are to provide the Post graduate Student with the ability to do more and deep scientific investigations in switchgear and protection engineering. The course will also enable students to follow the new trends in the field of protection engineering. This aims give the base to develop more reliable work either in the academic or practical fields.

2- Course Objectives

1- Demonstration the nature of electric power system, from its structure, normal and abnormal conditions, Earthing systems: etc.
2- Demonstration the protective relay function and the requirments for correct and reliable protection desicion.
3- Study the diffrent types of protection schemes, including their characteristics and their performance during diffrent power systems states.
4- Report the states and conditions of wrong decisions of relay schemes with suitable corrective solutions.
5- Find some interestings problems which need more investigations in an attend to present more reliable protection schemes.

3- Intended Learning Outcomes (ILOs)

Field	Program ILOs that the course contribute in achieving	Course ILOs
Knowledge&Understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	A1-2-1 Disscuss the diffrent forms of power system structure. A1-2-2 Understand the nature of protection relays and their requirments. A1-2-3 Understand the fault nature, types and their impact on power system. A1-2-4 discuss the methods of system analysis during fault state.
Intellectual skills		
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	B2-1-1 Study the system during the fault state. B2-1-2 Discuss the different methods of Short circuit analysis B2-1-3 Evaluate the performance of protective relay schemes during different conditions
Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	C1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using Matlab software.
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	C3-1-1 Evaluate methods and tools reported in a specified published articles and researches related Switchgear and protection field
General skills		
D4- Establish rules and indicators for assessing the performance of others.	D4-1 Design standards to evaluate others performance.	D4-1-1 Prepare technical reports and present results on Protection engineering.

4- Course Contents

Week No.	Topic	Total Hours	Contact hrs Lec.	Tut.	Lab.	Course ILOs Covered (By No.)
Week-1-4	Structure of electric power system, Different forms of earthling systems	3	3	-	-	A1-4-1 A1-4-2 A1-4-3 A1-4-4
Week-5-10	Faults type and nature, methods of fault analysis and detection, relay schemes as comparators, protection requirements and concepts of electromagnetic , static and digital relays	3	3	-	-	B-2-1 B2-2 C-1-1-1 C-1-1-2
Week-11-15	Protective transducers, current and voltage transformers	3	3	-	-	A-1-4-1 A-1-4-2 C-1-1-1
Week-16-20	Distribution system protection schemes, Fuses, Sectionalizers, reclosers, instantaneous, time delay over current, and directional over current	3	3	-	-	c-1-1-1 c-2-1-1
Week-21-23	Transmission line protective relay schemes, Pilot and non-pilots forms, responds of distance relays with their different measuring elements, performance evaluating under earth fault conditions, power swing and series compensation	3	3	-	-	A-1-4-1 B-2-2
Week 24-25	Rotating machinery protection , its behavior under normal and fault conditions	3	3	-	-	A-1-4-1 A-1-4-2 B-2-1 C-1-1
Week-26-27	Transformer protection, over current protection, percentage differential protection and detection the reason of wrong response	3	3	-	-	A-1-4-1 C-1-1-1
Week-28	Power aspects of power system phenomena	3	3	-	-	d-4-1-1-

5- Relationship between the course and the Program

Field	Academic Reference Standard(ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic	A-1-2-1	B-2-1-1	C-1-1-1	D-4-1-1

Standards that the course contribute in achieving.	A-1-2-2 A-1-2-3 A-1-2-4	B-2-1-2 B-2-1-3	C-3-1-1	

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%				100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Nature and structure of power system	1-6
2nd	System analysis during fault state	7-15
3rd	Requirments of protective relays and their functions	16-20
4th	Protective relay schemes of diffrent parts of power systems	21-28

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics			
		1st	2nd	3rd	4th
Knowledge & Understanding	A-1-2-1	X	X	X	X
	A-1-2-2			X	
	A-1-2-3				

	A-1-2-4			x	X
Intellectual Skills	B2-1-1		x		
	B2-1-2				
	B-2-1-3		x	x	
Professional Skill	C1-1-1		x	x	
	C3-1-1			x	x
General Skills	D4-1-1	x	x	x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
K&U	A1-2-1	x			x									
	A1-2-2	x			x	x								
	A1-2-3	x			x	x								
	A1-2-4	x			x	x								
Intellectual Skills	B2-1-1	x			x	x								
	B2-1-2	x			x									
	B2-1-3	x			x	x								
Professional Skills	C1-1-1	x			x	x								
	C3-1-1	x			x	x								
General Skills	D4-1-1									x				

10-Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material

		and tutorials.
		Assign a teaching assistance to follow up the performance of these group of students.
For outstanding Students		Hand out project assignments to those students.
		Give them some research topics to be searched using the internet and conduct presentation.
		Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods												
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Disscussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	A1-2-1	x											
	A1-2-2	x		x									
	A1-2-3	x		x									
	A1-2-4	x		x									
Intellectual Skills	B2-1-1	x		x									
	B2-1-2	x		x									
	B2-1-3	x		x									
Professional Skills	C1-1-1	x		x									
	C3-1-1	x		x									
General Skills	D4-1-1						x		x	x			

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

12- Facilities required for teaching and learning

A. **laboratory Usage: Null**

B. **Library Usage:**

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this

component of study.

13- List of references:
1- Protective relaying Principles and applications by J.Lewis Blackburn 1998
2- Power system relaying by Arun G.Phadke 1995

Course Coordinator:	Dr. Arafa Ali Helal
Program coordinator:	Dr. Azza Ahmed Dessouki
Head of the Department:	Prof. Dr. Samir Mohamed ElMakkawy

Date: / /2019.

EPM522
Switchgear & Protection Equipment

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M.Sc.**
Date of specification approval	***August 2019***

A- Basic Information

Title: Switchgear &Protection Equipment	Code Symbol: EPM 522	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in Switchgear & Protection Equipment . The aims of this course are to provide the Postgraduate Student, upon extended new knowledge of Switchgear & Protection Equipment course, with the advanced skills of how to applied the Switchgear & Protection Equipment . This course will also provide Postgraduate students with the necessary Analytical study, practical and professional skills concerning the course of undergraduate program. The extended course is content upon Circuit Breaking and Circuit Breakers, Study the physic and applications of Arcs (DC and AC), Network Switching Transient Conditions, Circuit Breaker Types, Specifications and Testing, Protection and Protective Schemes: Principal Types of Relays, Current Transformers and Voltage Transforming Devices, Protective Schemes in Electrical Power Systems, Performance Under Transient Conditions, Over-Voltage Protection and Insulation Coordination.

2-Graduate Attributes :

After completing the program the graduate would able to be:

1- **Application of the acquired specialized knowledge in his/her professional practice in the area of Switchgear &Protection Equipment .**

2- **Identify current problems and find solutions for it in the area of Switchgear &Protection Equipment .**

3- **Mastering of professional skills and the use of appropriate technological means in his/her professional practice in the area of Switchgear &Protection Equipment .**

4- **Knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to Switchgear &Protection Equipment .**

5- **Advanced skills in the definition, physics, analysis, and solving of problems related to Switchgear &Protection Equipment .**

6- **The ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using Switchgear &Protection Equipment .**

7- **The ability to deal effectively with classical and quantum statistics to identify/solve complex and open ended engineering problems related to Switchgear &Protection Equipment**

8- **Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools in the area of Switchgear &Protection Equipment .**

3- <u>Intended Learning Outcomes (ILOs) for the whole program</u>

This course is designed to achieve the above objectives through the following Intended Learning Outcomes (ILOs):

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	**A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering.**	**a1-1-1 Recognize Circuit Breaking, Circuit Breakers concepts, and the Circuit Breaker Types of the most common Switchgear and Protection Equipment.** **a1-1-2 Classify the Switchgear and Protection Equipment according to their Study of Arcs (DC and AC).** **a1-1-3Describe the Network Switching Transient Conditions .** **a1-1-4 Recognize Specifications and Testing.** **a1-1-5 Discus Protective Schemes for Principal Types of Relays, and Current Transformers and Voltage Transforming Devices .** **a1-1-6 Explain Protective Schemes in Electrical Power Systems, Performance Under Transient Conditions, and Over-Voltage Protection and Insulation Coordination .**
A2- Mutual influence between professional practice and its impacts on the environment.	**A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.**	**a2-1-1 Report and discuss social effects of Switchgear and Protection Equipment.**
A3- Main scientific advances in the field of	**A3-1 Demonstrate knowledge of contemporary, current, and**	**a3-1-1 Classify the Potential applications of Switchgear and**

electrical power and machines.	advanced topics related to Electrical Power And Machines Engineering issues.	Protection Equipment in advanced high voltage engineering.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	**B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.**	**b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Switchgear and Protection Equipment.**
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	**B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.**	**b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Switchgear and Protection Equipment.**
B5- Assess and analyze risks of the professional practice in the field of specialization.	**B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering**	**b5-1-1 Evaluate pros and cons of given methodologies for Switchgear and Protection Equipment development.**
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	**C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.**	**c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Switchgear and Protection Equipment problems, using latest engineering techniques, skills, and tools.**
C2- Write and evaluate technical and professional reports.	**C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.**	**c2-1-1 Write and evaluate a professional report on Switchgear and Protection Equipment applications on all insulations..**
D. General and transferrable skills		
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	**D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.**	**d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Switchgear and Protection Equipment .**
D5- Use different sources to obtain	**D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade**	**d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and**

knowledge and information.	and enhance their conceptual knowledge.	enhance their conceptual knowledge about Switchgear and Protection Equipment and technology.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	**d8-1-1 Exhibit the ability to learn more about Switchgear and Protection Equipment .**

4- Course Contents

Week No.	Topic	Total Hours	Hr. Lec.	Hr. Prac. Tut./
Weesks -1-3	Circuit Breaking, Circuit Breakers concepts, and the Circuit Breaker Types	12	-	-
Weeks- 4-10	Study of Arcs (DC and AC).	12	-	-
Weeks- 11-15	Network Switching Transient Conditions	12	-	-
Weeks- 16-20	Specifications and Testing	12	-	-
Weeks 21-25	Protective Schemes for Principal Types of Relays, and Current Transformers and Voltage Transforming Devices	18	-	-
Weeks- 26-28	Protective Schemes in Electrical Power Systems, Performance Under Transient Conditions, and Over-Voltage Protection and Insulation Coordination	18	-	-
	Total	84		

5- <u>Relationship between the course and the Program</u>

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	**Intellectual Skills**	**Professional Skills**	**General Skills**
Program Academic Standards that the course contributes in achieving.	**A1(a1-1) , A2 (a2-1), A3 (a3-1)**	**B1 (b1-1), B3 (b3-1), B5 (b5-1)**	**C1 (c1-1), C2 (c2-1)**	**D2 (d2-1), D5 (d5-1), D8 (d8-1)**

6- <u>Course Subject Area:</u>

A	B	C	D	E	F	G	

Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100%

7- Course Topics

Topic No.	Topic	Weeks
1st	Circuit Breaking, Circuit Breakers concepts, and the Circuit Breaker Types	1-3
2nd	Study of Arcs (DC and AC).	4-10
3rd	Network Switching Transient Conditions	11-15
4th	Specifications and Testing.	16-20
5th	Protective Schemes for Principal Types of Relays, and Current Transformers and Voltage Transforming Devices.	21-25
6th	Protective Schemes in Electrical Power Systems, Performance Under Transient Conditions, and Over-Voltage Protection and Insulation Coordination.	26-28

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Course ILOs									
a1-1-1 Recognize Circuit Breaking, Circuit Breakers concepts, and the Circuit Breaker Types of the most common Switchgear and Protection Equipment.	x	x							
a1-1-2 Classify the Switchgear and Protection Equipment according to their Study of Arcs (DC and AC).		x							
a1-1-3Describe the Network Switching Transient Conditions .			x		x				

	1	2	3	4	5	6	7	8	9
a1-1-4 Recognize Specifications and Testing.				x	x				
a1-1-5 Discus Protective Schemes for Principal Types of Relays, and Current Transformers and Voltage Transforming Devices.					x				
a1-1-6 Explain Protective Schemes in Electrical Power Systems, Performance Under Transient Conditions, and Over-Voltage Protection and Insulation Coordination.						x			
a2-1-1 Report and discuss social effects of Switchgear and Protection Equipment.	x							x	
a3-1-1 Classify the Potential applications of Switchgear and Protection Equipment in advanced of Switchgear and Protection Equipment.			x					x	
Course ILOs									
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) Switchgear and Protection Equipment to solve problems related to .	x	x	x	x	x	x	x	x	
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Switchgear and Protection Equipment .	x	x	x	x	x	x			
b5-1-1 Evaluate pros and cons of given methodologies for development Switchgear and Protection Equipment .								x	
Course ILOs									
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Switchgear and Protection Equipment problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x	x	
c2-1-1 Write and evaluate a professional report on Switchgear and Protection Equipment applications on all insulations..					x				
Course ILOs									
d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Switchgear and Protection Equipment .					x				
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electromagnetic.					x				
d8-1-1 Exhibit the ability to learn more about Switchgear and Protection Equipment . .					x				

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	**a1-1-1**	x			x	x								
	a1-1-2	x			x	x								
	a1-1-3	x			x	x								
	a1-1-4	x			x	x								
	a1-1-5	x			x	x								
	a1-1-6	x			x	x								
	a2-1-1		x	x					x	x				
	a2-2-2		x	x					x	x				
	a3-3-1		x	x					x	x				
	a3-3-2		x	x					x	x				
Intellectual Skills	**b1-1-1**				x	x								
	b3-1-1				x	x								
	b5-1-1		x	x					x	x				
Professional Skills	**c1-1-1**				x	x								
	c2-1-1		x	x					x	x				
General Skills	**d2-1-1**													x
	d5-1-1		x							x				
	d8-1-1		x							x				

10- <u>Assessment</u>

9.1 Assessment Methods

Final Written Examination   :   to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage:

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

1- Badri Ram, and D. N. Vishwakarma. Boo;, "Power System Protection and Switchgear", Tata McGraw-Hill Company Limited, 1995,& 22nd reprint 2007, Rclyyrlyrzldl.

2- J. B. Gupta, Switchgear and Protection, Publisher: S. K. Kataria &Sons, 2009 .

3- Program Coordination Committee:

Course Coordinator: Dr. Arafa Ali Helal

Program coordinator: Dr. Azza Ahmed Dessouki

Head of the Department: Prof. Dr. Samir Mohamed ElMakkawy

Date: /   /2019.

EPM601

Electrical Testing&Measurement2
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	August 2019

A- Basic Information

Title: Electrical Testing&Measurement2	Code Symbol: EPM 601	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in Electrical Testing & Measurement2. The aims of this course are to provide the Postgraduate Student, upon extended new knowledge of Electrical Testing & Measurement2 course, with the advanced skills of how to applied the Electrical Testing & Measurement2. This course will also provide Postgraduate students with the necessary Analytical study, practical and professional skills concerning the course of undergraduate program. The extended course is content upon a set of advanced on high voltage engineering measurement and testing: measurement of high direct current voltages, measurement of high a.c. and impulse voltages, measurement of high d.c., a.c. and impulse currents as well as testing of Insulators and Bushings, testing of Isolators and Circuit Breakers, testing of Cables, testing of Transformers, testing of Surge Diverters, and tests are associated with explanation of theory and procedures. The main objectives of this course are to equip the students with:

1. Knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to Electrical Testing & Measurement2 .
2. Advanced skills in the definition, physics, analysis, and solving of problems related to Electrical Testing & Measurement2 .
3. The ability to extend knowledge and develop models and methods and use techniques, principles

and laws of engineering science in order to lead to engineering applications design using Electrical Testing & Measurement2 .

4. The ability to deal effectively with classical and quantum statistics to identify/solve complex and open ended engineering problems related to .

5. Electrical Testing & Measurement2.

6. Identify current problems and find solutions for it in the area of . Electrical Testing & Measurement2

7. Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools in the area of . Electrical Testing & Measurement2

8. Application of specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of . Electrical Testing & Measurement2

3- <u>Intended Learning Outcomes (ILOs) for the whole program</u>

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Recognize the advanced measurement of high direct current voltages, concepts of the most common **Electrical Testing and Measurements**. a1-2-2 Classify the **Electrical Testing and Measurements** according to their Advanced application of measurement of high a.c. and impulse voltages. a1-2-3 Describe the measurement of high d.c., a.c. and impulse currents. a1-2-4 Recognize the testing of insulators and bushings. a1-2-5 Discuss testing of Isolators and Circuit Breakers. a1-2-6 Explain testing of Cables. a1-2-7 Describe testing of Transformers. a1-2-8 Explain tests which are associated with

		explanation of theory and procedures.
A2- Mutual influence between professional practice and its impacts on the environment	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss social effects of **Electrical Testing and Measurements**.
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate Knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Classify the Potential applications of **Electrical Testing and Measurements**. in advanced measurement and testing engineering.

| **B. Intellectual skills** |||

| B5- Assess and analyze risks of the professional practice in the field of specialization. | B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering | b5-1-1 Evaluate pros and cons of given methodologies for developm **Electrical Testing and Measurements**. |

| **C. Professional and practical skills** |||

| C1- Apply the basic as well as the modern professional skills in the field of specialization. | C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems. | c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to **Electrical Testing and Measurements** problems, using latest engineering techniques, skills, and tools. |
| C2- Write and evaluate technical and professional reports. | C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters. | c2-1-1 Write and evaluate a professional report on **Electrical Testing and Measurements** applications on all insulations.. |

| **D. General and transferrable skills** |||

D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to **Electrical Testing and Measurements**.
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about **Electrical Testing and Measurements** and technology.
D8- Learn independently and seek	D8-1 Express a strong foundation of continuous	d8-1-1 Exhibit the ability to learn more about **Electrical Testing and Measurements**.

continuous learning.	learning so they can maintain their technical competency.	

4- Course Contents

Week No.	Topic	Total Hours	Lec.	-Tut./Prac
Weeks-1-4	Advanced measurement of high direct current voltages.	12	12	-
Weeks-5-8	Advanced measurement of high a.c. and impulse voltages.	12	12	-
Weeks-9-12	Advanced measurement of high d.c., a.c. and impulse currents.	12	12	-
Weeks-13-16	Advanced testing of insulators and bushings.	12	12	-
Weeks-17-20	Advanced testing of Isolators and Circuit Breakers.	12	12	-
Weeks-21-24	Advanced testing of Cables.	12	12	-
Weeks-25-28	Advanced testing of Transformers.	12	12	-
	Total	84	84	

5- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1(a1-2) , A2 (a2-1), A3 (a3-1)	B5 (b5-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D5 (d5-1), D8 (d8-1)

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100

							%

7- **Course Topics.**

Topic No.	Topic	Weeks
1st	measurement of high direct current voltages.	1-4
2rd	measurement of high a.c. and impulse voltages.	5-8
3ed	measurement of high d.c., a.c. and impulse currents.	9-12
4th	testing of insulators and bushings.	13-16
5th	testing of Isolators and Circuit Breakers.	17-20
6th	testing of Cables.	21-24
7th	testing of transformers.	25-28

8- **ILOs Matrix Topics**

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Recognize the advanced measurement of high direct current voltages, concepts of the most common **Electrical Testing and Measurements**.	x						
a1-2-2 Classify the **Electrical Testing and Measurements** according to their Advanced application of measurement of high a.c. and impulse voltages.		x					
a1-2-3 Describe the measurement of high d.c., a.c. and impulse currents.			x				
a1-2-4 Recognize the testing of insulators and bushings.		x	x	x			

Course ILOs							
a1-2-5 Discuss testing of Isolators and Circuit Breakers.	x				x		
a1-2-6 Explain testing of Cables.		x	x			x	
a1-2-7 Describe testing of Transformers.				x	x	x	x
a1-2-8 Explain tests which are associated with explanation of theory and procedures.						x	
a2-1-1 Report and discuss social effects of **Electrical Testing and Measurements** applications.				x	x	x	x
a3-1-1 Classify the Potential applications of **Electrical Testing and Measurements**. in advanced electrical power and machines systems.				x	x	x	x

Course ILOs	Intellectual Skills						
b5-1-1 Evaluate pros and cons of given methodologies for develop **Electrical Testing and Measurements**.						x	x

Course ILOs	Professional Skills						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to , **Electrical Testing and Measurements** using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on **Electrical Testing and Measurements** all insulations.							

Course ILOs	General Skills						
d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to **Electrical Testing and Measurements**. .						x	x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about **Electrical Testing and Measurements**.		x		x			x
d8-1-1 Exhibit the ability to learn more about **Electrical Testing and Measurements**.					x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a1-2-6	x			x	x								
	a1-2-7	x			x	x								
	a1-2-8	x								x				
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
Intellectual Skills	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x	x				
General Skills	d2-1-1												x	

d5-1-1		x						x				
d8-1-1		x						x				

10- Assessment

10.1 Assessment Methods

Final Written Examination   :   to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

11-   Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector. Measuring laboratory.

C. laboratory Usage:

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs. Students are expected also to prepare and conduct some experiments in measuring laboratory relating to determination of the measuring and testing course.

D. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.
Essential Books (Text Books):
1. Sawhny, J., An Introduction to Electrical and Electronic Measurements, McGraw Hill, 1975
2.Frank: An Introduction to Electrical Instrumentation and Measuring Systems, McGraw Hill, 1992

13- Program Coordination Committee:

Course Coordinator: **Prof, Dr.** Sobhy Serry Dessouky

Program coordinator: **Dr. Azza Ahmed Dessouki**

Head of the Department: **Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

EPM602

Theories and Analysis of Electrical Machines (2)

Course Specification

Program on which the course is given	**MSc in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	MSc
Date of specification approval	*August 2019*

A- Basic Information

Title: Theories and Analysis of Electrical Machines (2)	Code Symbol: EPM 602	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

8- Course Aims:

The aims of this course are to provide the students, upon completing the electrical power and machines engineering Program , with solid background knowledge and tools of modern theory of electrical machines. This course will also provide students with the ability to understand electromagnetic energy conversion devices. Also, they have to be capable of know how to deal with axis transformation (reference frame theory) which is important in modeling of poly phase electrical machines. By the end of this course the students will be capable of analyzing and modeling of modern electrical machine drive systems.

The main Objectives of this course are to equip the students with:

1. Apply knowledge and the concepts of electromagnetic energy conversion.

2. Provide the basic knowledge in the definition, design, simulation, and solving of problems related to magnetically coupled circuits.

3. Describe the basic methodologies of modeling of electrical machines using axis transformation..

4. Explain the basic knowledge of modern electrical drive systems.

5. Use a CAD tool such as MATLAB to simulate different machine models.

9- Intended Learning Outcomes (ILOs):

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1- Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a PH.D thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering	a1-2-1 Recognize the main parts of electromagnetic systems. a1-2-2 Recognize the function of electrical machine parts in energy conversion process . a1-2-3 Recognize the modern control techniques in electrical drive.
A2- The knowledge related to the impact of professional practice on the Environment, and the work carried out for conservation and preservation.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment	a2-1-1 Recognize the new computer simulation tools such as Matlab that can be used in electrical machine simulation.
B. Intellectual skills		
B1- Analyze and evaluate information in the field of specialization, and relate it to solve problems and formulate theories.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a Ph. D. thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Select appropriate mathematical approximation function based on analytical thinking, to write electrical and mechanical system equations. b1-1-2 Apply Matlab simulink in modeling and simulation of electrical machines.

B3- Be creative and innovative.	B3-1 Demonstrate creative and innovative thinking in problems solving, using latest engineering techniques, skills, and tools.	b-3-1-1 Compare between traditional and modern control strategies of electrical drives.
B5- Assess and analyze risks in professional practice.	B5-1 Assess and analyze risks of the professional practice in Electrical Power And Machines Engineering.	b5-1-1 Evaluate pros and cons of given methodologies for modern electrical machine drives

C. Professional and practical skills

C1- Master the basic as well as the latest professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Apply knowledge of mathematics, science, design, and engineering practice integrally to solve engineering problems relevant to modeling and control of electrical machines. c1-1-2 Develop a computer program using MATLAB software package to simulate electrical machines.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional report related to Electrical Power And Machines technical matters.	c2-1-1 Write and evaluate a professional report on **electrical machine drives.**

D. General and transferrable skills

D2- Use information technology to enhance his/her professional practice	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to **Electrical machine theory**
D4- Educating and evaluating others.	D4-1 Design standards to evaluate others performance.	d4-1-1 comparing between different modeling and control methods of electrical machines according to national standards.

3- Course Contents

Week No.	Topic	Total Hours	Lec.	-Tut./Prac
Weeks-1-4	Magnetically coupled circuits	12	12	-

Weeks-5-8	Principles of electromechanical energy conversion :	12	12	-
Weeks-9-12	Modeling of poly phase machines:	12	12	-
Weeks-13-16	Reference frame theory in electrical machine:	12	12	-
Weeks-17-20	Modern electrical machine drive systems:	12	12	-
Weeks-21-24	Artificial intelligence in electrical machine drives	12	12	-
Weeks-25-28	Computer simulation of electrical machines	12	12	-
	Total	84	84	

10- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1(a1-2) , A2 (a2-1)	B1 (b1-1) B3 (b3-1) B5 (b5-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1),

11- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	20%	60%	20%	-		100 %

12- Course Topics.

Topic No.	Topic	Weeks

1st	Magnetically coupled circuits.	1-4
2nd	Electromagnetic energy conversion .	5-8
3rd	Modeling of three phase machines	9-12
4th	Reference frame theory in electrical machine	13-16
5th	Modern electrical machine drive systems	17-20
6th	Artificial intelligence in electrical machine drives	21-24
7th	Computer simulation of electrical machines	25-28

13- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs	Knowledge & Understanding						
a1-2-1 Recognize the main parts of electromagnetic systems.	x						
a1-2-2 Recognize the function of electrical machine parts in energy conversion process .		x					
a1-2-3 Recognize the modern control techniques in electrical drive.			x				
a2-1-1 Recognize the new computer simulation tools such as Matlab that can be used in electrical machine simulation. .	x				x		
Course ILOs	Intellectual Skills						
b1-1-1 Select appropriate mathematical approximation function based on analytical thinking, to write electrical and mechanical system equations.						X	X

Course ILOs							
b1-1-2 Apply Matlab simulink in modeling and simulation of electrical machines.							X
b-3-1-1 Compare between traditional and modern control strategies of electrical drives.					X	X	
b5-1-1 Evaluate pros and cons of given methodologies for modern electrical machine drives							X
Course ILOs	Professional Skills						
c1-1-1 Apply knowledge of mathematics, science, design, and engineering practice integrally to solve engineering problems relevant to modeling and control of electrical machines.	x	x	x	x	x		
c1-1-2 Develop a computer program using MATLAB software package to simulate electrical machines.						x	x
c2-1-1 Write and evaluate a professional report on electrical machine drives.							x
Course ILOs	General Skills						
d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Electrical machine theory						x	x
d4-1-1 comparing between different modeling and control methods of electrical machines according to national standards.			x		x		x

14- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	A1-2	x			x	x								
	A1-3	x			x	x								
	A2-1	x			x	x								
Intellectual Skills	B1-1	x			x	x								
	B3-1	x			x	x							x	
	B5-1	x				x								
Professional Skills	C1-1				x	x								
	C2-1												x	
General Skills	D2-1									x			x	
	D4-1							x		x				

15- Assessment

9.1 Assessment Methods
Final Written Examination: to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

16-   Facilities required for teaching and learning
Blackboard – Class Room Equipped with Computer and Video Projector. Measuring laboratory.
A.laboratory Usage:
Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs. Students are expected also to prepare and

conduct some experiments in measuring laboratory relating to determination of the measuring and testing course.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

17- List of references:

Essential Books (Text Books):

- Krause, Paul, et al. Analysis of electric machinery and drive systems. Vol. 75. John Wiley & Sons, 2013.

- Fitzgerald, Arthur Eugene, et al. Electric machinery. Vol. 5. New York: McGraw-Hill, 2003.

Recommended Books:

- El Hawary, Mohamed E. "Principles of electric machines with power electronic applications." (1986).

11-Program Coordination Committee:

Course Coordinator: **Prof, Dr. Ahmed Elsaid Kalas**

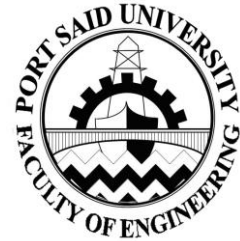   **Dr. Mahmoud Fawzi**

Program coordinator: **Dr. Azza Ahmed Dessouki**

Head of the Department: **Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

EPM603
Analysis of Electrical Power Systems

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	August 2019

A- Basic Information

Title: Control of Power System	Code Symbol: EPM 603	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course aims to teach the students the necessary knowledge of the advanced power system analysis to recognize the behaviors of an electrical power systems. The course introduces the required advanced analysis methods for simulating the power angle stability and voltage stability. The role of the reactive power devices for enhancing the power system behavior is investigated in this course to realize their worthy in the preventive and corrective control. The assessment of the power system security and its indices is provided thoroughly discussed.

2- Course Objectives

The main Objectives of this course are to equip the students with:
1- Apply simulation software package to solve power system control problems
2- Utilize available library facilities to search for specific issues related to the course.
3- Present own understanding of particular issues in oral seminars
4- Form groups with other students to solve particular problems related to the course.

3- <u>Intended Learning Outcomes (ILOs) for the whole program</u>

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Discuss the basics differences of the analysis methods required for the steady state and dynamic behavior of power system. a1-2-2 Understand the basics of power system angle stability a1-2-3 Understand the basics of voltage stability a1-2-4 Understand the concept of power system security
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Recognize the necessity of VAR devices on the power system operation. A2-1-2 Understanding the concept of the corrective and preventive control
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related the power systems analysis.
B2- Solve specific problems on the basis of limited and	B2-1 Apply broad knowledge of modern computational methods and think critically to	B2-1-1 Apply broad knowledge of modern computational methods to solve to model and to analyze control problems

contradictory information.	solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using Mat lab software
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	C3-1 -1 Evaluate methods and tools reported in a specified published articles and researches concerning of power systems.
D. General and transferrable skills		
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Prepare technical reports and present results of power system analysis methods.

1- Course Contents

Week No.	Topic	Total Hours	Hr. Lec.	Hr. Tut./ᴶPrac.
Weesks— 1-2	**Introduction to power system analysis**	**6**	**6**	-
Weeks- 3-4	**Power system analysis methods**	**6**	**6**	-
Weeks- 5-6	**Power system steady state and dynamic behavior**	**6**	**6**	-

Weeks 7-8	**Difference between angle stability and voltage stability**	**6**	**6**	-
Week 9-10	**Modification of load flow equations for studying voltage stability and angle stability**	6	6	-
Weeks-11-14	**Voltage stability indices**	12	12	-
Weeks-15-18	**VAR devices and its representation in for the corrective and preventive control**	12	12	-
Weeks 19-22	**Power angle stability**	12	12	-
Week 23-24	**Students presentations**	6	6	
Week 25-26	**Power system security concept**	6	6	
Week 27-28	**Assessment of power system security**	6	6	
	Total	84	84	

2- **Relationship between the course and the Program**

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1(a1-2) , A2 (a2-1),	B1 (b1-1), B3 (b2-1),	C1 (c1-1), C2 (c3-1)	D5 (d5-1),

3- **Course Subject Area:**

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100 %

4- **Course Topics**

Topic No.	*Topic*	

		Weeks
1st	**Introduction to power system analysis**	**1-2**
2nd	**Power system analysis methods**	**3-4**
3rd	**Power system steady state and dynamic behavior y**	**5-6**
4th	**Difference between angle stability and voltage stabilit**	**7-8**
5th	**Modification of load flow equations for studying voltage stability and angle stability**	**9-10**
6th	**Voltage stability indices**	**11-14**
7th	**VAR devices and its representation in for the corrective and preventive control**	**15-18**
8th	**Power angle stability**	**19-23**
9th	**Power system security concept**	**24-28**

1- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Course ILOs									
a1-2-1 Discuss the basics differences of the analysis methods required for the steady state and dynamic behavior of power system.	x	x							
a1-2-2 Understand the basics of power system angle stability		x							
a1-2-3 Understand the basics of voltage stability			x		x				
a1-2-4 Understand the concept of power system security				x	x				
a2-1-1 Recognize the necessity of VAR devices on the power system operation.					x				
A2-1-2 Understanding the concept of the corrective and preventive control.						x			
Course ILOs									

Course ILOs									
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to power control systems.	x	x	x	x	x	x	x	x	
B2-1-1 Apply broad knowledge of modern computational methods to solve to model and to analyze control problems	x	x	x	x	x	x			
Course ILOs									
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using Matlab software	x	x	x	x	x	x	x	x	
C3-1 -1 Evaluate methods and tools reported in a specified published articles and researches concerning of power systems.							x		
Course ILOs									
d5-1-1 Prepare technical reports and present results of power system analysis methods.							x		

1- **Teaching and Learning Method:**

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x			x									
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a2-1-1	X			x	x								
Intellectual Skills	b1-1-1	X			x	x								
	b2-1-1	X			x	x								
Professional Skills	c1-1-1	X			x	x								
	C3-1-1	X			x	x								
	D5-1-1									x				

4- **Assessment**

9.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

5- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

10.1 laboratory Usage:

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs.

10.2 Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

6- List of References:

Course and Lab Notes:
No lectures and Labs notes.

Essential Books (Text Books):

1- Hadi Saadat, " Power System Analysis", McGraw Hill. 2nd edition

2- J. Machowski, J. Bialek, and J. Bumby, Power system dynamics: stability and control, John Willey& Sons, 2008

3- A. Wood and B. Wollenberg, Power Generation, operation and control, John Willey& Sons, 1996.

11-Program Coordination Committee:

Course Coordinator:	**Dr. Elsaid Elaraby**
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

EPM604
High and Extra-High Voltage Engineering

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	August 2019
Date of specification approval	MS.C

A- Basic Information

Title: High and Extra-High Voltage Engineering	Code Symbol: EPM 604	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in High and Extra-High Voltage Engineering . The aims of this course are to provide the Postgraduate Student, upon extended new knowledge of High and Extra-High Voltage Engineering course, with the advanced skills of how to applied the High and Extra-High Voltage Engineering. This course will also provide Postgraduate students with the necessary Analytical study, practical and professional skills concerning the course of undergraduate program. The extended course is content upon Gas Breakdown, Ionization, De-Ionization, Self-Sustained Discharges, Breakdown Mechanisms, Corona, Breakdown under Alternating Field, Electronegative Gases, Breakdown in Insulating Liquids, Breakdown in Solid Die-Electric, Fields Calculation and Control Over-Voltages and Over-Voltage Protection, Traveling Waves and Applications, Insulation Coordination.The main Objectives of this course are to equip the students with:

1- Knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to High and Extra-High Voltage Engineering.

2- Advanced skills in the definition, physics, analysis, and solving of problems related to High and Extra-High Voltage Engineering.

3- The ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using High and Extra-High Voltage Engineering .

4- The ability to deal effectively with classical and quantum statistics to identify/solve complex and open ended engineering problems related to High and Extra-High Voltage Engineering .

5- Identify current problems and find solutions for it in the area of . High and Extra-High Voltage Engineering

6- Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools in the area ofHigh and Extra-High Voltage Engineering

7- Application of specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of . High and Extra-High Voltage Engineering

2- <u>Intended Learning Outcomes (ILOs) for the whole program</u>

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Recognize General background of Breakdown, and Field calculations concepts of the most common High and Extra-High Voltage Engineering . a1-2-2 Classify the High and Extra-High Voltage Engineeringaccording to their Gas Breakdown, and Ionization & De-Ionization.. a1-2-3Describe the Breakdown Mechanisms. a1-2-4 Recognize theElectronegative gases. a1-2-5 DiscusBreakdown in Insulating Solids& Liquids. a1-2-6 Explain the Corona Discharge. a1-2-7 Describe Self-Sustained Discharges Breakdown . a1-2-8 Explain Breakdown Time.. a1-2-9 DescribeTraveling Waves and Applications, Insulation Coordination.

A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss social effects of **High and Extra-High Voltage Engineering**.
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Classify the Potential applications of **High and Extra-High Voltage Engineering** in advanced high voltage engineering.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to **High and Extra-High Voltage Engineering**.
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to **High and Extra-High Voltage Engineering** .
B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering	b5-1-1 Evaluate pros and cons of given methodologies for **High and Extra-High Voltage Engineering** development.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to **High and Extra-High Voltage Engineering** problems, using latest engineering techniques, skills, and tools.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power	c2-1-1 Write and evaluate a professional report on **High and Extra-High Voltage Engineering** applications on all insulations..

	And Machines technical matters.	
D. General and transferrable skills		
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to **High and Extra-High Voltage Engineering**.
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about **High and Extra-High Voltage Engineering** and technology.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1Exhibit the ability to learn more about **High and Extra-High Voltage Engineering** .

3- Course Contents

Week No.	Topic	Total Hours	Hr. *Lec.*	Hr. *Tut./Prac.*
Weesks-1-4	**General background of Breakdown, and Field calculations.**	12	-	-
Weeks-5-8	**Gas Breakdown, and Ionization & De-Ionization.**	12	-	-
Weeks-9,10	**Breakdown Mechanisms.**	6	-	-
Weeks-11,12	**Electronegative Gases.**	6	-	-
Weeks-13-16	**Breakdown in Insulating Solids& Liquids**	12	-	-
Weeks-17-20	**Corona Discharge.**	12	-	-
Weeks-21-22	**Self-Sustained Discharges**	6	-	-

Weeks-23-24	**Breakdown Time.**	6	-	-
Week-25-28	**Traveling Waves and Applications, Insulation Coordination.**	12	-	-
	Total	84		

4- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1(a1-2) , A2 (a2-1), A3 (a3-1)	B1 (b1-1), B3 (b3-1), B5 (b5-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D5 (d5-1), D8 (d8-1)

5- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100%

6- Course Topics

Topic No.	Topic	Weeks
1st	**General background of Breakdown, and Field calculations.**	**1-4**
2nd	**Gas Breakdown, and Ionization & De-Ionization.**	**5-8**
3rd	**Breakdown Mechanisms.**	**9,10**
4th	**Electronegative Gases.**	**11,12**
5th	**Breakdown in Insulating Solids& Liquids**	**13-16**
6th	**Corona Discharge.**	**17-20**

7th	**Self-Sustained Discharges**	21,22
8th	**Breakdown Time.**	23,24
9th	**Traveling Waves and Applications, Insulation Coordination.**	25-28

7- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Course ILOs									
a1-2-1 Recognize **General background of Breakdown, and Field calculations c**oncepts of the most common **High and Extra-High Voltage Engineering** .	X	X							
a1-2-2 Classify the **High and Extra-High Voltage Engineering**according to their **Gas Breakdown, and Ionization & De-Ionization**.		X							
a1-2-3 a1-5-3Describe the **Breakdown Mechanisms**.			X		X				
a1-2-4Recognize the**Electronegative gases.**				X	X				
a1-2-5Discus**Breakdown in Insulating Solids& Liquids**.					X				
a1-2-6 Explain **the Corona Discharge**.						X			
a1-2-7 Describe **Self-Sustained Discharges Breakdown** .					X		X		
a1-2-8Explain **Breakdown Time.**								X	
a1-2-9 Describe**Traveling Waves and Applications, Insulation Coordination.**					X				X
a2-1-1 Report and discuss social effects of **High and Extra-High Voltage Engineering**	X							X	
a3-1-1 Classify the Potential applications of **High and Extra-High Voltage Engineering** in advanced high voltage engineering.			X					X	

Course ILOs									
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) **High and Extra-High Voltage Engineering** to solve problems related to .		x	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to		x	x	x	x	x	x		
High and Extra-High Voltage Engineering b5-1-1 Evaluate pros and cons of given methodologies for development **High and Extra-High Voltage Engineering**ent.								x	
Course ILOs									
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to **High and Extra-High Voltage Engineering** problems, using latest engineering techniques, skills, and tools.		x	x	x	x	x	x	x	x
c2-1-1 W **High and Extra-High Voltage Engineering** rite and evaluate a professional report on applications on all insulations.						x			
Course ILOs									
d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to **High and Extra-High Voltage Engineering**.						x			
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electromagnetic.						x			
d8-1-1Exhibit the ability to learn more about **High and Extra-High Voltage Engineering**.						x			

8- Teaching and Learning Method:

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a1-2-6	x			x	x								
	a1-2-7	x			x	x								
	a1-2-8	x								x				
	a1-2-9	x								x				
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1				x	x								
	b3-1-1				x	x								
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x	x				
General Skills	d2-1-1													x
	d5-1-1		x							x				
	d8-1-1		x							x				

9- <u>Assessment</u>

9.1 Assessment Methods

Final Written Examination   :   to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

10- <u>Facilities required for teaching and learning</u>

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

10.3 laboratory Usage:

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs.

10.4 Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:
    No lectures and Labs notes.
Essential Books (Text Books):

4- Dr. M. S. Naidu & Dr. V. Kamaraju " High Voltage Engineering" , Publisher: McGraw-Hill,1982.

5- E. Kuffel, M. Abdulla, "High Voltage Engineering", The Pergamon Press,Text-Book, 1990.

6- M. Khalifa, al., "High Voltage Engineering: Theory and Practica, Mmarcel Dekker, New York, 1990.

7- Ravindra Arora, Wolfgang Mosch"High Voltage and Electrical Insulation Engineering", Wiley, IEEE Press,2011.

11-Program Coordination Committee:

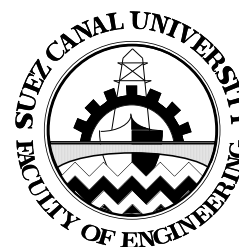|	
Course Coordinator:	**Prof, Dr.** SobhySerryDessouky
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: / /2019.

EPM605
Control of Power System

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	August 2019
Date of specification approval	MS.C

A- Basic Information

Title: Control of Power System	Code Symbol: EPM 605	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

7- Course Aims:

This course is aim to reach the students the necessary knowledge of practical operation and control of power systems under different operations with different control strategies. The requency and power transfer control is studied and discussed. The voltage control are also explained. The design of power system controllers is taught and practical examples are given.

8- Course Objectives

The main Objectives of this course are to equip the students with:
5- Apply simulation software package to solve power system control problems
6- Utilize available library facilities to search for specific issues related to the course.
7- Present own understanding of particular issues in oral seminars
8- Write short papers on certain topics of the course.
9- Form groups with other students to solve particular control problems

9- **Intended Learning Outcomes (ILOs) for the whole program**

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Discuss the basics differences between the traditional and non-traditional power system control. a1-2-2 Understand the theories, basics of power system control a1-2-3 Understand the basics of load frequency control a1-2-4 Understand the basics of voltage control
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Recognize the necessity of power system control. A2-1-2 Discuss the different control schemes
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to power control systems.
B2- Solve specific problems on the basis of limited and	B2-1 Apply broad knowledge of modern computational methods and think critically to	B2-1-1 Apply broad knowledge of modern computional methods to solve to model and to analyze control problems

contradictory information.	solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using Matlab software
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	C3-1 -1 Evaluate methods and tools reported in a specified published articles and researches concerning of power systems.
D. General and transferrable skills		
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Prepare technical reports and present results of power system control methodologies.

5- Course Contents

Week No.	Topic	Total Hours	Hr. Lec.	Hr. Tut./Prac.
Weesks-1-4	**Introduction to control theory**	12	12	-
Weeks-5-8	**Power system control parameters**	12	12	-
Weeks-9-12	**Generation control**	6	6	-

Weeks-13-15	**Excitation and voltage colntrol**	**6**	**6**	-
Weeks-16-19	**Load control**	6	6	-
Weeks-20-21	**Power transfer control**	6	6	-
Weeks22-23	**Frequency control**	6	6	-
Weeks-24	**Power system controller design**	6	6	-
Week-25	**Modern power system control**	6	6	-
Week 26	**Students presentations**	6	6	
Week 27	**Matlab simulation**	6	6	
Week 28	**Real life of power control system**	6	6	
	Total	84		

6- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1(a1-2) , A2 (a2-1),	B1 (b1-1), B3 (b2-1),	C1 (c1-1), C2 (c3-1)	D5 (d5-1),

7- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100

								%

8- Course Topics

Topic No.	*Topic*	Weeks
1st	**Introduction to control theory**	**1-5**
2nd	**Power system control parameters**	**6-8**
3rd	**Generation control**	**9-10**
4th	**Excitation and voltage colntrol**	**11-13**
5th	**Load control**	**14-15**
6th	**Power transfer control**	**16-17**
7th	**Frequency control**	**18-20**
8th	**Power system controller design**	**21-22**
9th	**Modern power system control**	**23-24**
10th	**Students presentations**	**25**
11th	**Matlab simulation**	**26**
12th	**Recent reaserch in power control system**	**27**
13th	**Real life of power control system**	**28**

2- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Course ILOs									
a1-2-1 Discuss the basics differences between the traditional and non-traditional power system control.	x	x							

a1-2-2 Understand the theories, basics of power system control	x								
a1-2-3 Understand the basics of load frequency control		x		x					
a1-2-4 Understand the basics of voltage control			x	x					
a2-1-1 Recognize the necessity of power system control.				x					
A2-1-2 Discuss the different control schemes					x				
Course ILOs									
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to power control systems.	x	x	x	x	x	x	x	x	
B2-1-1 Apply broad knowledge of modern computional methods to solve to model and to analyze control problems	x	x	x	x	x	x			
Course ILOs									
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using Matlab software	x	x	x	x	x	x	x	x	
C3-1 -1 Evaluate methods and tools reported in a specified published articles and researches concerning of power systems.				x					
Course ILOs									
d5-1-1 Prepare technical reports and present results of power system control methodologies.				x					

2- Teaching and Learning Method:

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x			x									
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a2-1-1	X			x	x								
Intellectual Skills	b1-1-1	X			x	x								
	b2-1-1	X			x	x								
Professional Skills	c1-1-1	X			x	x								
	C3-1-1	X			x	x								
	D5-1-1									x				

10-   Assessment

9.1 Assessment Methods

Final Written Examination   : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

11-   Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

10.5 laboratory Usage:

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs.

10.6 Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- <u>List of References:</u>

Course and Lab Notes:
No lectures and Labs notes.

Essential Books (Text Books):

4- Lou Van der Sluis, Transient in Power Systems, Publisher: John Willey& Sons, 2001.

5- J. Machowski, J. Bialek, and J. Bumby, Power system dynamics: stability and control, John Willey& Sons, 2008

6- A. Wood and B. Wollenberg, Power Generation, operation and control, John Willey& Sons, 1996.

11-Program Coordination Committee:

Course Coordinator:	**Dr.** Ahmed A. Daoud
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

EPM606
Power Electronics Systems

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	Master of Science
Date of specification approval	*August 2019*

A- Basic Information

Title: **Power Electronics Systems**	**Code Symbol**: EPM 606	
Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course aims to acquire the student with the essential knowledge to understand of the Power Electronics Systems The aims of this course are to provide the students with a solid background on the diodes, transistors, thyristors, power transistors, protection methods for single-phase and three-phase rectifiers, power-factor improvement, dc choppers with static loads, ac choppers with phase control, loop control with single and three phases, various types of transformers with static loads.

2- Course Objectives

1. Become acquainted with the basic necessary background in the diodes, transistors, thyristors, power transistors.
2. Familiarize the students with the protection methods for single-phase and three-phase rectifiers, power-factor improvement.
3. Introduce the students to the dc choppers with static loads, ac choppers with phase control, loop control with single and three phases, various types of transformers with static loads.

3- <u>Intended Learning Outcomes (ILOs)</u>

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering.	A1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of power electronics systems
A4- Fundamentals of ethical & legal professional practice in the field of specialization.	A4-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field of Electrical Power And Machines Engineering.	A4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in power electronic systems
A5- Basics and principles of quality in professional practice in the field of specialization.	A5-1 Explain quality assurance concepts of different Electrical Power And Machines components and systems development phases.	A-5-1-1 Explain quality assurance concepts of different Power electronics systems
A6- Basics and ethics of scientific research.	A6-1 Recognize basics and ethics of scientific research.	A-6-1-1 Explain quality assurance concepts of different Power electronics systems
B. Intellectual skills		
B6- Plan to imporove	B6-1 Plan to improve	B6-1-1 Plan to improve performance in

performance in the field of of specialization.	performance in the field of Electrical Power And Machines Engineering.	the Power electronics systems.
B7- Take professional decisions in different professional practical contexts.	B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development Electrical Power And Machines systems.	B7-1-1 Select the suitable Power electronics systems for different system operation based on analysis.

D. General and transferrable skills		
D1- Communicate effectively in different aspects.	D1-1 Express professional and communication skills effectively in different aspects.	D1-1-1 Express professional and communication skills effectively in different aspects of Power electronics systems.
D3- Adopt self-assessment and specify the needs of personal learning.	D3-1 Apply self evaluation and specify his educational needs related to Electrical Power And Machines aspects.	D3-1-1 Analysis of different Power electronics systems applications problems
D6- Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts for Power electronics systems.
D7- Demonstrate a high level of competence in the time management.	D7-1Demonstrate a high level of competence in the time management.	D7-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge in Power electronics systems.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	D8-1-1 Learn independently and seek continuous learning for Power electronics systems. .

4- Course Contents

Week No.	Topic	Total Hours	Contact hrs			Course ILOs Covered (By No.)
			Lec.	Tut.	Lab.	
Week 1 - 4	**Lecture:** Introduction to the diodes, transistors, and thyristors.	6	6	-		**A1,b5, b6**

Week 5+6	**Lecture:** Power transistors and protection methods for single-phase and three-phase rectifiers.	18	18			**b5, A5,d1**
Week 7+8+9	**Lecture:** Power-factor improvement, dc choppers with static loads.	15	15			**a4, a6,b7,d6**
Week 10 - 14	**Lecture:** Ac choppers with phase control.	12	12			**a3, a4, a6,d3**
Week 15 - 20	**Lecture:** Loop control with single and three phases.	15	15			**a1, c3, d7, d8**
Week 21 - 28	**Lecture:**Various types of transformers with static loads.	18	18			**D7, A6**
Total		84	84			

5- Relationship between the course and the Program

Field			
	Knowledge & Understanding	Intellectual Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1 (a1-1), A4 (a4-1) A5 (a5-1), A6 (a6-1),	B6 (b6-1) B7 (b7-1)	D1 (d1-1), D3 (d3-1), D6 (d3-1), D7 (d7-1), D8 (d3-1),

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	40%	60%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction to the diodes, transistors, and thyristors.	1-2
2nd	Power transistors and protection methods for single-phase and three-phase rectifiers.	3-8

	Power-factor improvement, dc choppers with static loads.	
3rd		9-13
4th	Ac choppers with phase control.	14-17
5th	Loop control with single and three phases.	18-22
6th	Various types of transformers with static loads.	23-28

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th
Course ILOs	**Knowledge & Understanding**					
a1-1-1 Understand the atomic structure and energy bands for various electrical materials.	X	X	X	X	X	
A4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in electrical material		X	X	X	X	X
A-5-1-1 Explain quality assurance concepts of different Power electronics systems		X	X	X	X	
A-6-1-1 Explain quality assurance concepts of different Power electronics systems		X	X	X	X	
Course ILOs	**Intellectual Skills**					
B6-1-1 Plan to improve performance in the Power electronics systems.		X		X		X
B7-1-1 Select the suitable material for different system operation based on analysis.		X		X		X
Course ILOs	**General Skills**					
D1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using latest engineering techniques, skills, and tools.		X	X	X	X	X
D3-1-1 Analysis of different electrical materials applications problems		X	X	X	X	X
D6-1-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts for Power electronics systems.		X	X	X	X	X

D7-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge in Power electronics systems.		X	X	X	X		X						
D8-1-1 Learn independently and seek continuous learning for Power electronics systems. .		X	X	X	X		X						

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	X	X											
	A4-1-1	X	X											
	A5-1-1	X	X											
	A6-1-1	X	X											
Intellectual Skills	B6-1-1	X	X											
	B7-1-1	X	X											
General Skills	D1-1-1	X	X											
	D3-1-1	X	X											
	D6-1-1	X	X											
	D7-1-1	X	X											
	D8-1-1	X	X											

10- Assessment

9.1 Assessment Methods

Final Written Examination   :   To assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

11- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Library.

E. laboratory Usage:
None.

F. Library Usage:
Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:
No lectures and Labs notes.

Essential Books (Text Books):
1. N. Mohan and T. M. Undeland, Power Electronics: Converters, Applications, and Design, Springer, Third Edition, 2002.
2. H. Professor and W. Daniel, Power Electronics, McGraw-Hill, First Edition, 2010.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Dr Attia El Sadawi**
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

EPM607
Microprocessor Applications in Electric Power and Machines (2)

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	Master of Science
Date of specification approval	*August 2019*

A- Basic Information

Title: Microprocessor Applications in Electric Power and Machines (2)	**Code Symbol**: EPM 607	
Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

14-   Course Aims:

This course is designed to extend the basic concepts learned in computer architecture. The course aims

to acquire students with the knowledge to understand the concepts of microprocessor architecture, instruction set, assembly language, memory mapping, and interfacing techniques for the MIPs microprocessor. The course provides the students with the necessary practical and professional skills to write efficient assembly and machine code for programming the microprocessor for various applications in electric power and machines engineering..

The main Objectives of this course are to equip the students with:

1- Relate performance metrics to architectural parameters.

2- Demonstration of the knowledge and understanding of the performance metrics to architectural parameters.

3- Specify the important tradeoffs in instruction set design.
Identify the problems and tradeoffs encountered in the design of computer processors, and specify specific example from the current state of the art family of Reduced Instruction Set Architectures (the MIPS architecture).
4- Relate the concept of memory hierarchy to cache designs and the design of virtual memory management units.

15- <u>Intended Learning Outcomes (ILOs)</u>

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering.	a1-1-1 Recognize terms of computer architecture, instruction sets, addressing modes, and data/instruction formats. a1-1-2Identify components of memory organization. a1-1-3Describe I/O architectures a1-1-4Recognize various types of computer architecture such as distributed, multiprocessor and parallel systemsand their applications in electrical machines.

A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Discuss the recent and update developments in the most important themes related to electrical power and machines engineering.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	b2-1-1Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with incomplete data) related to electrical power and machines engineering.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using latest engineering techniques, skills, and tools.
D. General and transferrable skills		
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.

16- Course Contents

Lecture Topics	Total Hours	Lecture Hours	Practical /Tutorial Hours
Terms of Computer Architectures	6	6	--
Instruction Sets, Basic Data Types, Addressing Modes	18	18	--
Memory Organization: Virtual Memory and Virtual Top Real Mapping Memory	12	12	--
Memory Hierarchy and Cache Memory	12	12	--
Conventional Architecture	15	15	--
Pipelined Processors, Parallel Array Processors	12	12	--
I/O Systems Organization, I/O Processors, I/O Channels, I/O Support for Multiprocessors	9	9	--
Total	84	84	--

17- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1 (a1-1), A3(a3-1)	B1 (b1-1), B2(b2-1),	C1 (c1-1)	D5 (d5-1)

18- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	40%	60%	-	-		100%

19- Course Topics.

Topic No.	Topic	Weeks

1st	Overview and definations	1-2
2nd	Data Representation and Instruction set Design	3-8
3rd	The Memory Hierarchy	9-16
4th	Conventional Architecture	17-21
5th	Pipelined and Parallel Processors	22-25
6th	I/O Characteristics and Performance	26-28

20- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th
Course ILOs	**Knowledge & Understanding**					
a1-1-1 Recognize terms of computer architecture, instruction sets, addressing modes, and data/instruction formats.	X	X				
a1-1-2 Identify components of memory organization.			X			
a1-1-3 Describe I/O architectures						X
a1-1-4 Recognize various types of computer architecture such as distributed, multiprocessor and parallel systems and their applications in electrical machines.				X	X	
a3-1-1 Discuss the recent and update developments in the most important themes related to electrical power and machines engineering.			X	X	X	X
Course ILOs	**Intellectual Skills**					
b1-1-1 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.			X	X	X	X
b2-1-1 Apply broad knowledge of modern computational methods and think critically to			X	X	X	X

solve unstructured problems (with incomplete data) related to electrical power and machines engineering.					
Course ILOs	**Professional Skill**				
c1-1-1Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using latest engineering techniques, skills, and tools.		X	X	X	X
Course ILOs	**General Skills**				
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.		X	X	X	X

21- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	X	X											
	a1-1-2	X	X											
	a1-1-3	X	X											
	a1-1-4	X	X											
	a3-1-1	X	X							X				
Intellectual Skills	b1-1-1	X	X											
	b2-1-1	X	X											
Professional Skills	c1-1-1	X	X											
General Skills	d5-1-1									X	X	X		

22- <u>Assessment</u>

9.1 Assessment Methods

Final Written Examination : To assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

23- <u>Facilities required for teaching and learning</u>

Blackboard – Class Room Equipped with Computer and Video Projector - Library.

G. laboratory Usage:

None.

H. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

24- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Principles of Computer Architecture,*by Miles J. Murdocca and Vincent P. Heuring, Prentice Hall, 2000.*

*Recommended Books***:**

- Digital Design, third Edition, by M. Morris Mano, Prentice Hall, 2002.

25- <u>Program Coordination Committee:</u>

Course Coordinator:	**Dr. Rehab Farouk Abdel-Kader**
Program coordinator:	**Dr. Azza** Ahmed Dessouki
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

EPM608
Electromagnetics
Course Specification

Quality Assurance & Accreditation Unit

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**MS.C**
Date of specification approval	*August 2019*

A- Basic Information

Title: Electromagnetics	Code Symbol: EPM 608	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in Electromagnetic. The aims of this course are to provide the Postgraduate Student, upon extended new knowledge of Electromagnetic course, with the advanced skills of how to applied the Electrostatic and Electromagnetic fields. This course will also provide Postgraduate students with the necessary Analytical study, practical and professional skills concerning the course of undergraduate program. The extended course is content upon advanced solution of Laplace,s, and Poisson's Equation, Solving Laplace's Through, Numerical Iteration, Experimental mapping methods for static and magnetic fields, advanced solution of curvilinear square, the iteration method, Time-Varying Fields& Maxwell's Equations, Maxwell's Equations in integral form, Static electrical field problems, Solution by field mapping, steady current mapping& resistance of simple geometries, advanced conform mapping method& Inversion transformation. Time Varying Currents and Fields in Conductors, Maxwell's Equations, Electromagnetic Energy Transfer, Experimental and Numerical Methods for Solution of Electromagnetic Problems, Methods of Numerical Computations. The main Objectives of this course are to equip the students with:

1. Knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to Electrostatic and Electromagnetic fields .
2. Advanced skills in the definition, physics, analysis, and solving of problems related to Electrostatic and Electromagnetic fields .
3. The ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using Electrostatic and Electromagnetic fields .
4. The ability to deal effectively with classical and quantum statistics to identify/solve complex and open ended engineering problems related to Electrostatic and Electromagnetic fields ..
5. Identify current problems and find solutions for it in the area of Electrostatic and Electromagnetic fields . .
6. Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools in the area of Electrostatic and Electromagnetic fields . .
7. Application of specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of Electrostatic and Electromagnetic fields . .

2- <u>Intended Learning Outcomes (ILOs) for the whole program</u>

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC	a1-2-1 Recognize the Supplement part of Laplace's and Poission's equations (related to under graduate program), concepts of the most common Electromagnetic.

professional practice.	thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-2 Classify the Electromagnetic according to their Advanced application of Laplace's and Poission's equations on uniqueness theorem.. a1-2-3 Describe the Experimental Mapping Methods using Field Sketches using curvilinear square sketches. a1-2-4 Recognize the Solving Laplace's Through, and numerical iterations. a1-2-5 Discuss Time varying field &Maxwell's equations in point, and integral form. a1-2-6 Explain Solution by field mapping of steady current to obtain resistance , inductance, and conductance. a1-2-7 Describe some applications of conform mapping on general inversion transformations. a1-2-8 Explain Numerical Methods for Solution of Electromagnetic Problems.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss social effects of Electromagnetic applications.
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-3-1 Classify the Potential applications of electromagnetic in advanced high voltage engineering.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Electromagnetic.
B3- Demonstrate a high level of competence in the coordination of different sources of	B3-1 Use integrated approaches including the coordination of different sources of knowledge and	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Electromagnetic.

knowledge to solve professional problems.	practices to solve professional scientific problems.	
B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering	b5-1-1 Evaluate pros and cons of given methodologies for electromagnetics development.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electromagnetic problems, using latest engineering techniques, skills, and tools.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	c2-1-1 Write and evaluate a professional report on electromagnetic applications on all insulations..
D. General and transferrable skills		
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to electromagnetic.
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electromagnetic and technology.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about electromagnetic.

3- Course Contents

eek No.	Topic	Total Hours	Lec.	Tut./Prac.
Weesks-1,2	Supplement part of of Laplace's and Poission's equations, after electromagnetic field1(related to under graduate program.	6	6	

Weeks-3,4	Application of Laplace's and Poission's equations on uniqueness theorem.	6	6	
Weeks-5,8	Examples solution of the Laplace's & Poission's Equations.	12	12	
Weeks-9,12	Experimental Mapping Methods using Field Sketches using curvilinear square sketches.	12	12	
Weeks-13,14	Solving Laplace's Through, and numerical iterations.	6	6	
Weeks-15,16	Achieve the results of comparisons of iteration on the computer program.	6	6	
Weeks-17,18	Modeling examples and applications of iterations	6	6	
Weeks-19,22	Time varying field &Maxwell's equations in point, and integral form.	12	12	
Weeks-23,24	Solution by field mapping of steady current to obtain resistance , inductance, and conductance.	6	6	
Weeks-25,26	Application of conform mapping on general inversion transformations.	6	6	
Week-27-28	Numerical Methods for Solution of Electromagnetic Problems.	6	6	
Total		84	84	

4- <u>Relationship between the course and the Program</u>

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1(a1-2) , A2 (a2-1), A3 (a3-1)	B1 (b1-1), B3 (b3-1), B5 (b5-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D5 (d5-1), D8 (d8-1)

5- <u>Course Subject Area:</u>

A	B	C	D	E	F	G	
Humanitie	Mathematic	Basic	Applied	Computer	Project	Disccretionr	Total

s and Social Science	s and Basic Sciences	Engineering Science	Engineering And Design	Applications and ICT	s and practice	y subjects	
---	---	30%	70%	-	-		100%

6- Course Topics.

Topic No.	Topic	Weeks
1st	**Laplace's and Poission's equations**	**1-2**
2nd	**Application of Laplace's and Poission's equations on uniqueness theorem.**	**3-8**
3nd	Experimental Mapping Methods.	**9-12**
4rd	Solving Laplace's Through, and numerical iterations.	**13-18**
5th	Time varying field &Maxwell's equations in point, and integral form.	**19-22**
6th	Solution by field mapping of steady current to obtain resistance , inductance, and conductance.	**23-24**
7th	Application of conform mapping on general inversion transformations.	**25-26**
8th	Numerical Methods for Solution of Electromagnetic Problems.	**27-28**

7- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Course ILOs								
a1-2-1 Recognize the Supplement part of Laplace's and Poission's equations (related to under graduate program), concepts of the most common Electromagnetic.	x	x						
a1-2-2 Classify the Electromagnetic according to their Advanced application of Laplace's and Poission's equations on uniqueness theorem..		x						
a1-2-3 Describe the Experimental Mapping Methods using Field Sketches using curvilinear square sketches.			x					

	1	2	3	4	5	6	7	8
a1-2-4 Recognize the Solving Laplace's Through, and numerical iterations.				x				
a1-2-5 Discuss Time varying field &Maxwell's equations in point, and integral form.					x			
a1-2-6 Explain Solution by field mapping of steady current to obtain resistance , inductance, and conductance.						x		
a1-2-7 Describe some applications of conform mapping on general inversion transformations.							x	
a1-2-8 Explain Numerical Methods for Solution of Electromagnetic Problems.								x
a2-1-1 Report and discuss social effects of Electromagnetic applications.								x
a3-1-1 Classify the Potential applications of electromagnetic in advanced high voltage engineering.			x					x
Course ILOs								
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Electromagnetic.	x	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Electromagnetic.	x	x	x	x	x	x		
b5-1-1 Evaluate pros and cons of given methodologies for electromagnetics development.								x
Course ILOs								
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electromagnetic problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on electromagnetic applications on all insulations.								
Course ILOs								
d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to electromagnetic.					x			

	Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electromagnetic.									x				
d8-1-1 Exhibit the ability to learn more about electromagnetic.									x				

8- **Teaching and Learning Method:**

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a1-2-6	x			x	x								
	a1-2-7	x			x	x								
	a1-2-8	x								x				
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1				x	x								
	b3-1-1				x	x								
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x	x				
General Skills	d2-1-1												x	
	d5-1-1		x							x				
	d8-1-1		x							x				

9- **Assessment**

9.1 Assessment Methods
Final Written Examination 　　　: to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 **Assessment Schedule and Grades Distribution**

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

10- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

I. laboratory Usage:
Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs.

J. Library Usage:
Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:
No lectures and Labs notes.

Essential Books (Text Books):

1- Engineering Electromagnetics, 7th edition,published by 2006 McGraw-Hill Higher Education, by William H. Hayt, and John A. Buck, 2006.
2- Fundamentals of Engineering Electromagnetics, by David K. Cheng (Paperback - November 10, 1992).
3- Fundamentals of Electromagnetic field theory, By Hardback (USA), September 1974 , by A.A. Zaky, R. Hawley, 1974
4- Engineering Electromagnetic fields and waves, 2nd edition, published by , Wiley; 2 edition (January 18, 1988).

12- Program Coordination Committee:

Course Coordinator: **Prof, Dr. Sobhy Serry Dessouky**

Program coordinator: **Dr. Azza Ahmed Dessouki**

Head of the Department: **Prof. Dr. Samir Mohamed Elmakkawy**

Date: /   /2019

Course Specification EPM 609 (Transient in Linear Systems)

Course Specification

Program on which the course is given	M.Sc. in Electrical Power And Machines Engineering
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	M.Sc.
Date of specification approval	*August 2019*

A- Basic Information

Title: Automatic Control	Code Symbol: **EPM 609**	
Lecture	3 hours	
Tutorial	-	
Laboratory	-	
Total	3 hours	2000

B- Professional Information

18- Course Aims:

By the end of this course, the student should be able to understand the basic concepts of transient performance in linear circuits by studying simple electric circuits , magnetically linked circuits and inertia effect of rotating masses. The student should also learn about the transient performance of complex power circuits by studying variable resistance, magnatic stauration in electric circuits at rest, saturated rotating machines and vector control of induction motors.
The student shall attain the above mentioned objectives efficiently under controlled guidance and supervision.

19- Course Objectives

6- Demonstration of the knowledge and understanding of the basic concepts of transient performance in linear circuits.

7- Recognizability the importance of magnetically linked circuits and inertia effect of rotating masses in transient performance.

8- Demonstration of the knowledge and understanding of about the transient performance of complex power circuits by studying variable resistance.

9- Recognizability the importance of saturated rotating machines and vector control of induction motors in transient performance.

20- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic Transient linear systems.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss harmonic interaction with Transient linear systems.
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Classify the Potential applications of Transient linear systems.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating,	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Transient linear systems.

information to solve problems.	solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	b2-1-1 identify and apply appropriate methods for Transient linear systems
B4- Conduct a research study and/or writing systematic scientific study on Research problem.	B4-1 Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	B4-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to transient linear systems.
B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering	b5-1-1 Evaluate pros and cons of given methodologies for transient linear systems.

C. Professional and practical skills

C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to transient linear systems.

D. General and transferrable skills

D1- Communicate effectively in different aspects.	D1-1 Express professional and communication skills effectively in different aspects.	D1-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge
D4- Establish rules and indicators for assessing the performance of others.	D4-1 Design standards to evaluate others performance.	D4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge transient linear systems.
D6- Collaborate	D6-1 Collaborate effectively	D6-1-1 Collaborate effectively within

effectively within multidisciplinary team and lead teams in different professional contexts.	within multidisciplinary team and lead teams in different professional contexts.	multidisciplinary team and lead teams in different professional contexts in transient linear systems
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about transient linear systems.

21- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Transient performance in linear circuits.	18	18	--
2- Magnetically linked circuits.	12	12	--
3- Inertia effect of rotating masses.	12	12	--
4- Transient performance of complex power circuits.	12	12	--
5- Magnetic saturation in electric circuits at rest.	12	12	--
6-. Vector control of induction motors.	12	12	--
7- Abnormal Modes of operation of synchronous machines.	6	6	--
Total	84	84	--

22- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programs Academic Standards that the course contribute in achieving	A1, A2, A3, A4	B1, B2, B4, B5	C1	D1, D4, D6, D8

23- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30	70	---	---	---	100 %

24- Course Topics.

Topic No.	Topic	Weeks
1st	1- Transient performance in linear circuits.	1-6
2nd	2- Magnetically linked circuits.	7-8
3rd	3- Inertia effect of rotating masses.	9-12
4th	4- Transient performance of complex power circuits.	13-18
5th	5- Magnetic saturation in electric circuits at rest.	19-22
6th	6-. Vector control of induction motors.	23-26
7th	7- Abnormal Modes of operation of synchronous machines.	27-28

10-   ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	A1	X	X			
	A2	X	X	X		
	A3			X	X	X
	A4	X	X		X	X
Intellectual Skills	B1	X		X	X	X

	B2			X	X	
	B4		X	X		X
	B5			X	X	X
Professional Skill	C1		X	X	X	
General Skills	D1	X	X	X	X	X
	D4	X	X	X	X	X
	D6	X	X	X	X	X
	D8			X	X	X

11- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)			Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding		A1	X												
		A2	X	X	X	X	X				X				
		A3	X	X		X			X						
		A4	X	X		X			X						
Intellectual Skills		B1	X			X	X	X							
		B2	X	X	X	X			X						
		B4	X	X	X	X			X						
		B5	X	X	X	X			X						
Professional Skills		C1	X		X	X	X								

General Skill													
	D1	X	X	X	X					X			
	D4	X	X	X	X								
	D6	X	X	X	X					X			
	D8	X	X	X	X								

10 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

11- Facilities required for teaching and learning

C. laboratory Usage:

Students are expected to prepare and conduct some laboratory experiments relating to robot mechanism and its programming.

D. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

13- List of references:

1- Katsuhiko Ogata, "Modern Control Engineering", Prentice-Hall, 2002.
2- A.A.Zelenkov, " Transient analysis of electric power circuits by the classical method in the examples ",John Wiley & Sons, 2009.
3- D. Lynch, "Basic electronic and electric powers", C o l l e g e o f E n g i n e e r i n g , U n i v e r s i t y o f S a s k a t c h e w a n, 2014.

Course prof: Dr. Hala Elhadidy

Program coordinator:

Head of the Department: Pro. Dr. Samir M. Almekkawey.

Date: 30/4/2019.

EPM610

Design of Electrical Machines (2)

Course Specification

Course Specification

Program on which the course is given	**MSc in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	MSc
Date of specification approval	*August 2019*

A- Basic Information

Title: **Design of Electrical Machines (2)**	Code Symbol: EPM 610	
Lecture	3 hours	
Tutorial / Laboratory	–	
Total	3 hours	Bylaw 2000

B- Professional Information

25- Course Aims:

The aims of this course are to provide the students, upon completing the electrical power and machines engineering Program , with solid background knowledge and tools of modern theory of electrical machines. This course will also provide students with the ability to understand electromagnetic energy conversion devices. Also, they have to be capable of know how to deal with axis transformation (reference frame theory) which is important in modeling of poly phase electrical machines. By the end of this course the students will be capable of analyzing and modeling of modern electrical machine drive systems.

The main Objectives of this course are to equip the students with:

6. Apply knowledge and the concepts of electromagnetic energy conversion.

7. Provide the basic knowledge in the definition, design, simulation, and solving of problems related to magnetically coupled circuits.

8. Describe the basic methodologies of modeling of electrical machines using axis transformation..

9. Explain the basic knowledge of modern electrical drive systems.

10. Use a CAD tool such as MATLAB to simulate different machine models.

26- <u>Intended Learning Outcomes (ILOs)</u>:

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A6- Basics and ethics of scientific research.	A6-1 Recognize basics and ethics of scientific research.	A6-1-1 Recognize basics and ethics of scientific research for Design of Electrical Machines
B. Intellectual skills		
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	B2-1-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Design of Electrical Machines.
B6- Plan to imporove performance in the field of of specialization.	B6-1 Plan to improve performance in the field of Electrical Power And Machines Engineering.	B6-1-1 Plan to improve performance in the field of Design of Electrical Machines

	C. Professional and practical skills		
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	C3-1-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in the Design of Electrical Machines

	D. General and transferrable skills		
D6- Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts for the Design of Electrical Machines.

4- Course Contents

Week No.	Topic	Total Hours	Lec.	-Tut./Prac
Weeks-1-4	Magnetically coupled circuits	12	12	-
Weeks-5-8	Principles of electromechanical energy conversion :	12	12	-
Weeks-9-12	Modeling of poly phase machines:	12	12	-
Weeks-13-16	Reference frame theory in electrical machine:	12	12	-
Weeks-17-20	Modern electrical machine drive systems:	12	12	-
Weeks-21-24	Artificial intelligence in electrical machine drives	12	12	-
Weeks-25-28	Computer simulation of electrical machines	12	12	-
	Total	84	84	

27- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A6(a6-1)	B2 (b2-1) B6 (b6-1)	C3 (c3-1)	D6 (d6-1)

28- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	20%	60%	20%	-		100%

29- Course Topics.

Topic No.	Topic	Weeks
1st	Magnetically coupled circuits.	1-4
2nd	Electromagnetic energy conversion .	5-8
3rd	Modeling of three phase machines	9-12
4th	Reference frame theory in electrical machine	13-16
5th	Modern electrical machine drive systems	17-20
6th	Artificial intelligence in electrical machine drives	21-24
7th	Computer simulation of electrical machines	25-28

30- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs	**Knowledge & Understanding**						
A6-1-1 Recognize basics and ethics of scientific research for Design of Electrical Machines	x						
Course ILOs	**Intellectual Skills**						
B2-1-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Design of Electrical Machines.					X	X	
B6-1-1 Plan to improve performance in the field of Design of Electrical Machines							X
Course ILOs	Professional Skills						
C3-1-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in the Design of Electrical Machines	X	X	X	X	X	X	X
Course ILOs	General Skills						
D6-1-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts for the Design of Electrical Machines.			x		x		x
Teaching and Learning Method							

31- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	A6-1	x			x	x								
Intellectual Skills	B2-1	x			x	x								
	B6-1		X	X								X		X
Professional Skills	C3-1				x	x								
General Skills	D6-1										x		x	

32- Assessment

9.1 Assessment Methods
Final Written Examination: to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

33-   Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector. Measuring laboratory.

A.laboratory Usage:
Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs. Students are expected also to prepare and conduct some experiments in measuring laboratory relating to determination of the measuring and testing course.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

34-   List of references:

Essential Books (Text Books):

- Krause, Paul, et al. Analysis of electric machinery and drive systems. Vol. 75. John Wiley & Sons, 2013.

- Fitzgerald, Arthur Eugene, et al. Electric machinery. Vol. 5. New York: McGraw-Hill, 2003.

Recommended Books:

- El Hawary, Mohamed E. "Principles of electric machines with power electronic applications." (1986).

11-Program Coordination Committee:

Course Coordinator:	**Prof, Dr. Ahmed Elsaid Kalas**
	Dr. Mahmoud Fawzi
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

(EPM 611)
Control Systems of Electrical Machines

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	**Master degree**
Date of specification approval	*Dec 2013*

A- Basic Information

Title: Control of Electric Machines	**Code Symbol**: EPM611	
Lecture	3 hours	
Tutorial	--------	
Laboratory	--------	
Total	3 hours	Bylaw 2000
	prerequisite	

B- Professional Information

1- Course Aims:

The aims of this course are to provide the Post graduate Student with the basic knowledge and understanding of the control of electrical machines with different loads systems. This course will also enable students to employ electrical machines and power electronics for speed control. this

course will also provide students with the ability to analyize DC motors using single and three phases recifiers. It is also aimed that the student will get acquainted with control systems of AC machines. In addition, this course aims to acquire the student with harmonic analysis for different types of control systems.

2- Course Objectives

1. Demonstration of the knowledge and understanding of the importance of control of electrical machines with different loads systems.
2. Defination of the requirements of the performance and design of starting and breaking.
3. Recognizability of the different DC machines control systems.
4. Evaluation of different AC machines control systems.
5. Analyze the performance of single and three phases rectifiers.

3- Intended Learning Outcomes (ILOs)

Field	Program ILOs that the course contribute in achieving	Course ILOs
Knowledge&Understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice**.**	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	**A1-2-1**-Understand the basic theories of DC and AC motors **A1-2-2** Understand the theories, basics and specialized knowledge in the field of **Control of DC Machines.** **A1-2-3** Understand the theories, basics and specialized knowledge in the field of **Control of AC Machines.** **A1-2-4** Understand the theories, basics and specialized knowledge in the field of PWM techniques. **A1-2-5** Understand the theories, basics and specialized knowledge in the field of harmonics analysis
Intellectual skills		

B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	**B1-1-1** Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to PWM
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	**B3-1-1**- Analyze and evaluate published articles in the field of voltage fed inverters. **B3-1-2**- Analyze and evaluate published articles in the field of current fed inverters.
Professional skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	**C1-1-1** Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using Matlab software.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	**C2-1-1**-Writing a professional report about electrical machines drives.
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	**C3-1-1** Evaluate methods and tools reported in a specified published articles and researches related to electrical machines systems.
General skills		
General skills D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	**D5-1-1** Prepare technical reports and present results on control of electrical motors used with different loads

4- Course Contents

		Contact hrs	

Week No.	Topic	Total Hours	Lec.	Tut.	Lab.	Course ILOs Covered (By No.)
Week-1	Introduction to electrical machine control systems	3	3	-	-	A1-2-1 A1-2-2 C1-1-1
Week-2-3	Analysis of control system of DC motors using single phase rectifier	3	3	-	-	A1-2-1 A1-2-2 C1-1-1
Week-4-10	Analysis of control system of DC motors using three phase rectifier	3	3	-	-	A1-2-4 C1-1-1 C2-1-1
Week-11-15	Analysis of control system of DC motors using choppers	3	3	-	-	A1-2-2 C1-1-1
Week-16-20	Introduction to voltage fed converters, single phase-three phases inverters	3	3	-	-	B3-1-1 C1-1-1
Week-21-23	Pulse width modulation techniques	3	3	-	-	A1-2-5 B1-1-1
Week-24-26	Analysis of control system of AC motors	3	3	-	-	A1-2-1 A1-2-3 C2-1-1
Week-27	Current Fed Inverter	3	3	-	-	B3-1-2 C3-1-1
Week -28	Harmonics analysis for electrical drivers	3	3	-	-	A1-2-5 D5-1-1

5- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2	B1-1 B3-1	C1-1, C2-1, C3-1	D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and	Mathematics and	Basic Engineering	Applied Engineering	Computer Application	Projects and	Disccretionry subjects	**Total**

Social Science	Basic Sciences	ng Science	And Design	ns and ICT	practice		
---	---	40	60				100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction: "Electrical motor drive"	1-6
2nd	DC motor drive	7-10
3rd	AC motor drive	11-18
4th	Harmonics analysis for electrical Drives	19-28

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	
Knowledge & Understanding	A1-2-1	x	x	x		
	A1-2-2	x	x			
	A1-2-3			x		
	A1-2-4			x		
	A1-2-5				x	
Intellectual Skills	B-1-1-1			x		
	B3-1-1			x		
	B-3-1-2			x		
Professional Skill	C1-1-1	x	x	x		
	C2-1-1		x	x		
	C3-1-1			x		
General Skills	D5-1-1				x	

9- Teaching and Learning Method:

Course Intended learning outcomes	9- Teaching and Learning Method:

(ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modeling	Playing
Knowledge & understanding	A1-2-1	x			x									
	A1-2-2	x			x									
	A1-2-3	x			x									
	A1-2-4	x			x	x								
	A1-2-5	x			x	x								
Intellectual Skills	B1-1-1	x			x	x								
	B3-1-1	x			x	x								
	B3-1-2	x			x									
Professional Skills	C1-1-1	x			x	x	x							
	C2-1-1	x			x	x								
	C3-1-1			x	x	x								
General Skills	D5-1-1		x				x			x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment
11.1 Assessment Methods

Course Intended	Assessment Methods

Learning Outcome (ILOs)		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exam	Monitoring
Knowledge & Understanding	A1-2-1	x		x									
	A1-2-2	x		x									
	A1-2-3	x		x									
	A1-2-4	x		x									
	A1-2-5	x		x									
Intellectual Skills	B1-1-1	x		x									
	B3-1-1	x		x									
	B3-1-2	x		x									
Professional Skills	C1-1-1	x		x									
	C2-1-1	x		x									
	C3-1-1	x		x									
General Skills	D5-1-1						x		x	x			

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

12- Facilities required for teaching and learning

E. laboratory Usage:
Students are expected to prepare and conduct some laboratory experiments relating to recognize the machine drive components.

F. Library Usage:
Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

13- List of references:

4- Muhamad H. Rashid "(Power Elctronics handbook)", Academic Press , 2001
5- Seguier G."(Power electronics AC/DC converter),north oxford academic publishers ltd 1986
6- Mohan Ned (Power Elctronics and Drives) NMPERE PRESS 2003
7- Murphy J.M.D., (Power Electronic Control of AC Motor), PERGAMON PRESS 1988

8- Periodicals, Web sites, … etc
  -www.ieee.org
  -www.iee.org

 Course Coordinator: :   Dr. **Ahmed Elsayed Kalas**

Program Coordinator: **Dr. Azza** Ahmed Dessouki

Head of the Department: **Prof. Dr. Samir Mohamed ElMakkawy**

Date: / /2019

(EPM 612) Operation Of Power System

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	***August 2019***

A- Basic Information

Title: Operation of power system	**Code Symbol**: EPM 612

Lecture	3 hours	
Tutorial / Laboratory	**-**	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in operation of power system. For those students who look toward an industrial position after graduation, this course is designed to widen background in power system operation and help them to meet the industry demand. This course will also provides an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of operation of power system: economic dispatch, unit commitment, load shedding, generator and load characteristics and security analysis. The course is meant to create the background needed to understand the physics of power system operation and also prepare students for advanced courses in economic operation of power system. General operation will be taught in the context of technological applications. Emphasis will be on economic operation:

1. Knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to power system operation.
2. Advanced skills in the definition, physics, analysis, and solving of problems related to power system operation.
   9- The ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications operation of power system.
   10- The ability to deal effectively with classical and quantum statistics to identify/solve complex and open ended engineering problems related to power system operation.
   11- Identify current problems and find solutions for it in the area of power system operation.
   12- Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools in the area of power system operation.
   13- Application of specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of power system operation.

2- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		

A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Recognize the concepts of the economic dispatch. a1-2-2 Classify the generator and load characteristics. a1-2-3 Describe the important of economic operation. a1-2-4 Discuss the different methods to solve the economic dispatch and unit commitment. a1-2-5 Explain load shedding and its applications. a1-2-6 Discuss the security analysis.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss social effects of economic operation of power system (dispatch and unit commitment), load shedding and security analysis.
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Report new advances in economic operation of power sytem.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to power system operation.
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to power system operation,
C. Professional and practical skills		

C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to power system operation problems, using latest engineering techniques, skills, and tools.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	c2-1-1 Write and evaluate a professional report on different topics related to power system operation
D. General and transferrable skills		
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about power system operation technology.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about power system operation.

3- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1-Economic Dispatch taking into consideration different constraints	12	12	--
2- Unit commitment	12	12	--
3-Load Shedding	**12**	**12**	--

4- Generator characteristics	**12**	**12**	--
3- Load characteristics	12	12	--
4- Security Analysis	**12**	**12**	--
5- Optimal Power Flow	12	12	--
Total	**84**	**84**	**--**

4- <u>Relationship between the course and the Program</u>

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1 (a1-2), A2 (a2-1), A3 (a3-1)	B1 (b1-1), B3 (b3-1)	C1 (c1-1), C2 (c2-1)	D5 (d5-1), D8 (d8-1)

5- <u>Course Subject Area:</u>

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100 %

6- <u>Course Topics.</u>

Topic No.	Topic	Weeks
1st	Economic Dispatch taking into consideration different constraints	1-4
2nd	Unit commitment	5-8
3rd	Load Shedding	9-12
4th	Generator characteristics	13-16
5th	Load characteristics	17-20
6th	Security Analysis	21-24
7th	Optimal Power Flow	25-28

7- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs: Knowledge & Understanding							
a1-2-1 Recognize the concepts of the economic dispatch.	x						
a1-2-2 Classify the generator and load characteristics.				X	X		
a1-2-3 Describe the important of economic operation.	x	x					
a1-2-4 Discuss the different methods to solve the economic dispatch and unit commitment.	x	x					
a1-2-5 Explain load shedding and its applications.			X				
a1-2-6 Discuss the security analysis.						x	X
a2-1-1 Report and discuss social effects of economic operation of power system (dispatch and unit commitment), load shedding and security analysis.	x	x	X			x	X
a3-1-1 Report new advances in economic operation of power sytem.	x	X	X				
Course ILOs: Intellectual Skills							
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to power system operation.	x	X	X	X	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to power system operation,	x	x	x	x	x	x	x
Course ILOs: Professional Skill							
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to power system operation problems, using latest engineering techniques, skills, and tools.	x	X	X	X	x	x	x

c2-1-1 Write and evaluate a professional report on different topics related to power system operation	x	x	x	x	x	x	x
Course ILOs: **General Skill**							
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about power system operation technology.	x	x	x	x	x	x	x
d8-1-1 Exhibit the ability to learn more about power system operation.	x	x	x	x	x	x	X

8- Teaching and Learning Method:

		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	X			x	x								
	a1-2-2	X			x	x								
	a1-2-3	X			x	x								
	a1-2-4	X			x	x								
	a1-2-5	X			x	x								
	a1-2-6	X			x	x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1				x	x								
	b3-1-1				x	x								
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x	x				
	d5-1-1		x							x				
	d8-1-1		x							x				

9- Assessment

9.1 Assessment Methods

Final Written Examination　　　　: to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

10- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

10.1 laboratory Usage:

No laboratory

10.2 Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:
No lectures and Labs notes.

Essential Books (Text Books):

- Wood A. J., and Wollenberg B. F., " Power Generation Operation and Control, J. Wiley & Sons, New York, 1996.
- P. Kunder , Power system stability and control,McGraw-Hill
- El-Hawary M. E., and Stevenson W. D., " Optimal Economic Operation of Electric Power Systems", Mathematics in Science and Engineering, Vol. 142.

12 Program Coordination Committee:

Course Coordinator: **Dr. Azza Ahmed El Desouk**y

Program coordinator: **Dr. Azza Ahmed El Desouk**y

Head of the Department: **Prof. Dr. Samir Mohamed Elmakkawy**

Date: /   /2019.

EPM 613

Electrical Networks (2)

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	M.Sc.
Date of specification approval	August 2019

A- Basic Information

Title: Electrical networks (2)	**Code Symbol: EPM 613**
Lecture	3 hours

Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in electrical networks. For those students who look toward an industrial position after graduation, this course is designed to widen background in electrical networks and help them to meet the industry demand. This course will also provides an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of electrical networks: loads & energy forecasts, electric networks planning, grounding, system reliability and HVDC transmission. The course is meant to create the background needed to understand the physics of networks operations and also prepare students for advanced courses in electrical networks. General networks physics and operation will be taught in the context of technological applications. Emphasis will be on electrical networks planning in (generator, transmission and distribution). The main objectives of this course are to equip the students with:

1. Knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to electrical networks.
2. Advanced skills in the definition, physics, analysis, and solving of problems related to electrical networks.
3. The ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications operation using electrical networks.
4. The ability to deal effectively with classical and quantum statistics to identify/solve complex and open ended engineering problems related to electrical networks.
5. Identify current problems and find solutions for it in the area of electrical networks.
6. Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools in the area of electrical networks.
7. Application of specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of Electrical networks.

2. Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge	A1-2 Demonstrate sufficient specialized knowledge and a	a1-2-1 Recognize the concepts of the loads and energy forecasts.

in the field of learning, as well as the subjects that affect his/her professional practice.	deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-2 Classify the electric networks planning (genreration, transmission and distribution). a1-2-3 Describe the importance of grounding. a1-2-4 Discuss the different methods to measure the system reliability. a1-2-5 Explain HVDC systems, their components and applications. a1-2-6 Discuss the basics differences between the most common power quality disturbances and their effects on power system operations.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss social effects of HVDC applications, grounding and voltage fluctuations.
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Classify the Potential applications of HVDC in advanced electrical systems.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electrical networks.
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electrical networks.
C. Professional and practical skills		

C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electrical networks problems, using latest engineering techniques, skills, and tools.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	c2-1-1 Write and evaluate a professional report on different topics related to electrical networks.
D. General and transferrable skills		
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electrical networks technology.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about electrical networks.

3. Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1-Loads and energy forecasts.	12	12	--
2- Electric networks planning (generation)	6	6	--
3- Electric networks planning (transmission)	**6**	**6**	--
4- Electric networks planning (distribution)	**6**	**6**	--

3- Grounding	12	12	--
4- System reliability	**12**	**12**	--
5- HVDC.	12	12	--
6- System Management and power quality	**12**	**12**	--
7- Voltage fluctuations	6	6	--
Total	**84**	**84**	**--**

4.   Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1 (a1-2), A2 (a2-1), A3 (a3-1)	B1 (b1-1), B3 (b3-1)	C1 (c1-1), C2 (c2-1)	D5 (d5-1), D8 (d8-1)

5.   Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100 %

6.   Course Topics.

Topic No.	Topic	Weeks
1st	Loads and energy forecasts	1-4
2nd	Electric networks planning	5-10
3rd	Grounding	11-14
4th	System reliability	15-18

5th	HVDC							19-22
6th	System Management and power quality							23-26
7th	Voltage fluctuations							27-28

7. ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs: Knowledge & Understanding							
a1-2-1 Recognize the concepts of the loads and energy forecasts..	x						
a1-2-2 Classify the electric networks planning (genreration, transmission and distribution).		X					
a1-2-3 Describe the important of groundin			X				
a1-2-4 Discuss the different methods to measure the system reliability.				X			
a1-2-5 Explain HVDC systems, their components and applications.					x		
a1-2-6 Discuss the basics differences between the most common power quality disturbances and their effects on power system operations.						x	
a2-1-1 Report and discuss social effects of HVDC applications, grounding and voltage fluctuations.			X		x		x
a3-1-1 Classify the Potential applications of HVDC in advanced electrical systems.					x		
Course ILOs: Intellectual Skills							
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electrical networks.	x	X	X	X	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electrical networks.	x	x	x	x	x	x	x
Course ILOs: Professional Skill							
c1-1-1 Express competence skills, such as	x	X	X	X	x	x	x

identifying, formulating, analyzing, and creating engineering solutions related to electrical networks problems, using latest engineering techniques, skills, and tools.							
c2-1-1 Write and evaluate a professional report on different topics related to electrical networks.	x	x	x	x	x	x	x
Course ILOs: **General Skill**							
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electrical networks technology.	x	x	x	x	x	x	x
d8-1-1 Exhibit the ability to learn more about electrical networks.	x	x	x	x	x	x	X

8. Teaching and Learning Method:

		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	X			x	x								
	a1-2-2	X			x	x								
	a1-2-3	X			x	x								
	a1-2-4	X			x	x								
	a1-2-5	X			x	x								
	a1-2-6	X			x	x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1				x	x								
	b3-1-1				x	x								
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x	x				
	d5-1-1		x							x				
	d8-1-1		x							x				

9. Assessment

9.1 Assessment Methods

| Final Written Examination | : | to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification. |

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32
Total	100%	

10. <u>Facilities required for teaching and learning</u>

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library

K. laboratory Usage:

No laboratory

L. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11. <u>List of References:</u>

Course and Lab Notes:
 No lectures and Labs notes.
Essential Books (Text Books):
[1] J. Anillaga, D. A. Bradley, P. S. Bodge, *Power System Harmonics*, Wiley, 1985.
[2] P. Kunder , Power system stability and control,McGraw-Hill
[3] Eugene A. Feinberg, Applied Mathematices for Power Systems.

12. <u>Program Coordination Committee:</u>

 Course Coordinator: :   Dr. Azza Ahmed El Dessouky

 Program Coordinator: Dr. Azza Ahmed El Dessouky

 Head of the Department: **Prof. Dr. Samir Mohamed Elmakkawy**

 Date: / /2019

EPM614
Electrical Materials

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	Master of Science
Date of specification approval	*August 2019*

A- Basic Information

Title: Electrical Materials	Code Symbol: EPM 614	
Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

26-   Course Aims:

This course aims to acquire the student with the essential knowledge to understand of the electrical materials and their properties as the properties of a material provide a basis for understanding its behavior under various conditions, selecting a material for a particular use which involves consideration of a number of factors such as service requirements; manufacturing requirements and cost; cost of raw or bulk materials and customer preference. In addition, This course aims to acquire the student with the essential knowledge to understand and differentiate between various electrical materials and their characteristics from the atomic structure point of view as there are definite relationships between structure and properties which must be understood if the best use is to be made of materials in engineering. The course provides the students with the necessary practical and professional skills concerning the selection of the sound material to be used in an appropriate application, solving problems concerned with different electrical materials.

27-   Course Objectives

1. Demonstration of the knowledge and understanding of the characteristics of different electrical materials;
2. Understanding the atomic structure and energy bands for various electrical materials.
3. Recognizability of the applications of each aforementioned materials in an electrical engineering field.
4. Recognizability of the effect of contacting materials with others.
5. Analysis of different electrical materials applications problems
6. Evaluation of sound materials for various power system operation.

28-   Intended Learning Outcomes (ILOs)

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding			

A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering.	a1-1-1 Understand the atomic structure and energy bands for various electrical materials. a-1-1-2 Understand the relationships between the structure and properties of different electrical material.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	A2-1-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies in electrical material
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Discuss the recent and update developments in the most important materials related to electrical power and machines engineering.
A4- Fundamentals of ethical & legal professional practice in the field of specialization.	A4-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field of Electrical Power And Machines Engineering.	A4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in electrical material
B. Intellectual skills		
B7- Take professional decisions in different professional practical contexts.	B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development Electrical Power And Machines systems.	B7-1-1 Select the suitable material for different system operation based on analysis.
D. General and transferrable skills		
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	D2-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using latest engineering techniques, skills, and tools.

practice.		
D3- Adopt self-assessment and specify the needs of personal learning.	D3-1 Apply self evaluation and specify his educational needs related to Electrical Power And Machines aspects.	D3-1-1 Analysis of different electrical materials applications problems
D7- Demonstrate a high level of competence in the time management.	D7-1Demonstrate a high level of competence in the time management.	D7-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.

29- Course Contents

Lecture Topics	Total Hours	Lecture Hours	Practical /Tutorial Hours
Definitions, Theories, classification of electrical materials	6	6	--
Conducting Materials	18	18	--
Semiconducting Materials	15	15	--
Insulating Materials	12	12	--
Dielectric Materials	15	15	--
Magnetic Materials	18	18	--
Total	84	84	--

30- Relationship between the course and the Program

Field	Knowledge & Understanding	Intellectual Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1 (a1-1), A2 (a2-1), A3 (a3-1), A4 (a4-1)	B7 (b7-1)	D2 (d2-1), D3 (d3-1), D7 (d7-1)

31- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	40%	60%	-	-		100%

32- Course Topics.

Topic No.	Topic	Weeks
1st	Definitions, Theories, classification of electrical materials	1-2
2nd	Conducting Materials	3-8
3rd	Semiconducting Materials	9-13
4th	Insulating Materials	14-17
5th	Dielectric Materials	18-22
6th	Magnetic Materials	23-28

33- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th
Course ILOs	**Knowledge & Understanding**					
a1-1-1 Understand the atomic structure and energy bands for various electrical materials.	X	X	X	X	X	
a-1-1-2 Understand the relationships between the structure and properties of different electrical material.		X	X	X	X	
A2-1-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies in electrical material		X	X	X	X	
a3-1-1 Discuss the recent and update developments in the most important materials related to electrical power and machines engineering.		X	X	X	X	X
A4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in electrical material		X	X	X	X	X
Course ILOs	**Intellectual Skills**					
B7-1-1 Select the suitable material for different system operation based on analysis.		X		X		X
Course ILOs	**General Skills**					

D2-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions using latest engineering techniques, skills, and tools.	X	X X X X	X	
D3-1-1 Analysis of different electrical materials applications problems	X	X X X X	X	
D7-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	X	X X X X	X	

34- **Teaching and Learning Method:**

Course Intended learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	X	X											
	a1-1-2	X	X											
	A2-1-1	X	X											
	a3-1-1	X	X											
	A4-1-1	X	X											
Intellectual Skills	B7-1-1	X	X											
General Skills	D2-1-1	X	X											
	D3-1-1	X	X											
	D7-1-1	X	X											

35- **Assessment**

9.1 Assessment Methods
Final Written Examination : To assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 **Assessment Schedule and Grades Distribution**

Assessment Method	Percentage	week
Final Examination	100	32

Total	100%	

36- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Library.

M.laboratory Usage:

None.

N. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

37- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- N. Alagappan and N. T. Kumar "Electrical Engineering Materials" Tata McGraw-Hill Publishing Company Limted.1992.
- L.M.Gourd " An Introduction To Engineering Materials" Edward Arnold, the Educational, Academic and Medical, Publishibg Division of Hodder &Stoughton. 1982.
- L. Solymar and D. Walsh " Lectures on The Electrical Properties of Materials" Oxford New york, Oxford University Press 1984.

38- Program Coordination Committee:

Course Coordinator:	**Dr. Medhat Hegazy Elfar**
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.

Protection of Electric

Power Systems (2)
(EPM 615)

Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M.Sc.**
Date of specification approval	*August 2019*

A- Basic Information

Title: Protection of Electric Power Systems (2)	**Code Symbol: EPM 615**

Lecture	3 hours	
Tutorial	-----	
Laboratory	-----	
Total	3 hours	Bylaw 2000

B- Professional Information

1. <u>Course Aims</u>

This course is designed to extend basic concepts learned in electric power system protections systems with the advanced techniques used recently in the electrical stations and substations. This course aims to increase the engineer knowledge about the digital electric system protection. HVDC converter transformer protection. Finally, the adaptive protection schemes used in smart grid protection and the adaptive relays.

Application of specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of Protection of electric power systems.

2. <u>Course Objectives</u>

- **Demonstration the nature of electric power system, from its structure, normal and abnormal conditions, Earthing systems: etc.**
- **Demonstration the protective relay function and the requirments for correct and reliable protection desicion.**
- **Study the diffrent types of protection schemes, including their characteristics and their performance during diffrent power systems states.**
- **Report the states and conditions of wrong decisions of relay schemes with suitable corrective solutions.**
- **Find some interestings problems which need more investigations in an attend to present more reliable protection schemes.**

3. <u>Intended Learning Outcomes (ILOs)</u>

Field	Program ILOs that the course contribute in achieving	Course ILOs
Knowledge&Understanding		
A5- Basics and principles of quality in professional practice in the field of specialization.	A5-1 Explain quality assurance concepts of different Electrical Power And Machines components and systems development phases.	A5-1-1 Explain Quality Assurance concepts of different component models of filters and reactive power controllers and adaptive protections

Intellectual skills		
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	b2-1-1 identify and apply appropriate methods for discrimination of physics-based optical device models in the context of specific technological constraints.
B4- Conduct a research study and/or writing systematic scientific study on Research problem.	B4-1 Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	b4-1-1 Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper for Protection of Electric Power Systems.
B7- Take professional decisions in different professional practical contexts.	B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development Electrical Power And Machines systems.	b7-1-1 Present, evaluate, and interpret qualitative and quantitative data concern with protection systems and its applications system, to develop lines of argument and make sound judgments in accordance with their basic theories and concepts.
General skills		
D1- Communicate effectively in different aspects.	D1-1 Express professional and communication skills effectively in different aspects.	D1-1 Express professional and communication skills effectively in different aspects for Protection of Electric Power Systems.
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	D2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related power system protection and its applications.
D4- Establish rules and indicators for assessing the performance of others.	D4-1 Design standards to evaluate others performance.	D4-1-1 Prepare technical reports and present results on Protection engineering for Protection of Electric Power Systems
D6- Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1-1 Collaborate effectively within multidisciplinary team and for Protection of Electric Power Systems lead teams in different professional contexts.

13. Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Principals of Protection of electric power systems	18	18	--
2- Analysis of HVDC Converters protection	12	12	--
3- Principles of adaptive protection.	12	12	--
4- Introduction of the digital protection	12	12	--
5- Protection of smart grids	12	12	--
6- Protection of converter transformers and networks	12	12	--
7- Protection of renewable energy resources	6	6	--
Total	84	84	--

14. Relationship between the course and the Program

Field	Academic Reference Standard(ARS)			
	Knowledge & Understanding	**Intellectual Skills**	**Professional Skills**	**General Skills**
Program Academic Standards that the course contribute in achieving.	**A-5-1-1**	**B-2-1-1** **B-4-1-1** **B7-1-1**		**D-1-1-1** **D2-1-1** **D4-1-1** **D6-1-1**

15. Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disscretionry subjects**	**Total**
---	**---**	**30%**	**70%**				**100 %**

16. Course Topics.

Topic No.	Topic	Weeks
1st	1- Principals of Protection of electric power systems	**1-6**
2nd	2- Analysis of HVDC Converters protection	**7-10**

3rd	3- Principles of adaptive protection.	**11-14**
4th	4- Introduction of the digital protection	**15-18**
5th	5- Protection of smart grids	**19-22**
6th	6- Protection of converter transformers and networks.	**23-26**
7th	7- Protection of renewable energy resources	**27-28**

17. ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics			
		1st	**2nd**	**3rd**	**4th**
Knowledge & Understanding	**A-5-1-4**	X	X	X	X
Intellectual Skills	B2-1-1		x		
	B4-1-1				
	B-7-1-1		x	x	
General Skills	**D1-1-1**	x	x	x	
	D2-1-1	x	x	X	
	D4-1-1			x	X
	D6-1-1	x	x		x

18. Teaching and Learning Method:

Course Intended	12- Teaching and Learning Method:

learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
K&U	A5-1-1	x			x									
Intellectual Skills	B2-1-1	x			x	x								
	B4-1-1	x			x									
	B7-1-1	x			x	x								
General Skills	D1-1-1									x				
	D2-1-1	x			x	x								
	D4-1-1	x			x	x								
	D6-1-1	x			x	x								

10-Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these group of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment
11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)	Assessment Methods											
	Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Disscussion	Laboratory Test	Home Exm	Monitoring

		1	2	3	4	5	6	7	8	9	10	11	12
Knowledge & Understanding	**A5-1-1**	x											
Intellectual Skills	**B2-1-1**	x		x									
	B4-1-1	x		x									
	B7-1-1	x		x									
General Skills	**D1-1-1**						x		x	x			
	D2-1-1	x		x									
	D4-1-1			x		x	x	x					
	D6-1-1	x		x									

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

12- Facilities required for teaching and learning

G. laboratory Usage: Null

H. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

13-   List of references:

Essential Books (Text Books):
- Stanley H. Horowitz and Arun G. Phadke., "**Power System Relaying**", First Edition, 2008

Recommended Books:
   James J. Burke., "**Power Distribution Engineering: Fundamentals and Applications**", 1st Edition, 1994

Course Coordinator: Dr. Arafa Ali Helal

Program coordinator: **Dr. Azza Ahmed Dessouki**

Head of the Department: **Prof. Dr. Samir Mohamed ElMakkawy**

Date: / /2019.

Design of Power Electronic Circuits

Course Specification

EPM 616

Course Specification

Program on which the course is given	MSc in Electrical Engineering (Specialization: Power and Machines Engineering)
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MSc.
Date of specification approval	**August 2019**

A- Basic Information

Title: Design of Power Electronic Circuits	Code Symbol: EPM 616

Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

35- <u>Course Aims:</u>

The aims of this course are to provide the students with a solid background on the diodes, transistors, thyristors, power transistors, protection methods for single-phase and three-phase rectifiers, power-factor improvement, dc choppers with static loads, ac choppers with phase control, loop control with single and three phases, various types of transformers with static loads.

36- <u>Course Objectives:</u>

11. Become acquainted with the basic necessary background in the diodes, transistors, thyristors, power transistors.

12. Familiarize the students with the protection methods for single-phase and three-phase rectifiers, power-factor improvement.

13. Introduce the students to the dc choppers with static loads, ac choppers with phase control, loop control with single and three phases, various types of transformers with static loads.

37- <u>Intended Learning Outcomes (ILOs):</u>

Field	Program ILOs that the course contribute in achieving	Course ILOs

Knowledge & Understanding	A-1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering. A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering
	A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.
	A4- Fundamentals of ethical & legal professional practice in the field of specialization	A4-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field of Electrical Power And Machines Engineering.
	A6- Basics and ethics of scientific research.	A6-1 Recognize basics and ethics of scientific research.
Intellectual skills	B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and

		practices to solve professional scientific problems.
	B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering
	B6- Plan to imporove performance in the field of of specialization.	B6-1 Plan to improve performance in the field of Electrical Power And Machines Engineering.
Professional skills	C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.
General skills	D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.
	D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.

38- Course Contents

Week No.	Topic	Total Hours	Contact hrs			Course ILOs Covered (By No.)
			Lec.	Tut.	Lab.	
Week 1 - 4	**Lecture:** Introduction to the diodes, transistors, and thyristors.	6	6	-		**B3, b5, b6**
Week 5+6	**Lecture:** Power transistors and protection methods for single-phase and three-phase rectifiers.	6	6			**b5, b6**

Week 7+8+9	**Lecture:** Power-factor improvement, dc choppers with static loads. .	6	6			**a4, a6**
Week 10 - 14	**Lecture:** Ac choppers with phase control.	9	9			**a3, a4, a6**
Week 15 - 20	**Lecture:** Loop control with single and three phases.	9	9			**a1, c3, d8**
Week 21 - 28	**Lecture:** Various types of transformers with static loads.	6	6			**c3, d5, a6**

39- Relationship between the course and the Program

Field	National Academic Reference Standard (NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	**a1, a3, a4, a6**	**B3, b5,b6**	**C3**	**D5, d8**

40- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**10%**	**70%**	**10**	**10**		**100%**

41- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction to the diodes, transistors, and thyristors.	1-4
2nd	Power transistors and protection methods for single-phase and three-phase rectifiers.	5-6

3rd	Power-factor improvement, dc choppers with static loads.	7-9
4th	Ac choppers with phase control.	10-14
5th	Loop control with single and three phases.	15-20
6th	Various types of transformers with static loads.	21-28

12- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a-1	x			x	x								
	a-3	x			x	x								
	a-4	x			x	x								
	a-6	x			x	x								
Intellectual Skills	b-3	x			x	x							x	
	b-5				x								x	x
	b-6		x	x				x			x			
	c-3				x	x								
General Skills	d-5									x			x	
	d-8							x		x	x			

13- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of this group of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

14- Assessment

10.1 Assessment Methods

Course Intended learning outcomes (ILOs)		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Simulation Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussions	Laboratory Test	Home Exam	Monitoring
Knowledge & understanding	a-1	x		x				x					
	a-3	x		x				x					
	a-4	x		x				x					
	a-6	x		x				x					
Intellectual Skills	b-3	x		x				x					
	b-5					x					x		
	b-6				x						x	x	
Professional Skills	c-3	x		x				x					
General Skills	d-5		x			x							
	d-8				x		x						

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

11- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector – Basic Electricity and Electronics Lab - Library.

O. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. N. Mohan and T. M. Undeland, Power Electronics: Converters, Applications, and Design, Springer, Third Edition, 2002.
2. H. Professor and W. Daniel, Power Electronics, McGraw-Hill, First Edition, 2010.

.Course Coordinator   Program Coordinator

Dr. Sherif M. Sharroush   Dr. Azza Ahmed Dessouki

Head of the Department

Prof. Dr. Samir Mohamed Elmakkawy

Date: / /2019.

EPM617
Power Generation from Renewable Sources (2)
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	M.Sc.
Date of specification approval	**August 2019**

A- Basic Information

Title: Power Generation from Renewable Sources (2)	**Code Symbol**: **EPM617**	
Lecture	3 hours	
Tutorial	-----	
Laboratory	-----	
Total	3 hours	Bylaw 2000
First term	prerequisite	------

B- Professional Information

1- Course Aims

The aims of this course are to provide the Post graduate Student with the types of energy sources and the physical principles of energy conversions. This course will also enable students to recognize the basic idea of the photovoltaic cells, the structure of photovoltaic systems, and how to design photovoltaic system to supply stand alone load. The basic idea of the wind energy conversions and control strategies are also provided. It is also aimed that the student will get acquainted with the basic concepts of energy storage technologies and their applications. Emphasis on

1- Demonstration of the knowledge and understanding of the different types of renewable energy resourses and their applications.
2- Analysis the generated electricial power from renewable energy resources.
3- Assessment the costs, reliablilty and environmental effect of renewable energy.
4- Demonstration of the knowledge and understanding of the Characteristics and the basic principles of energy storages.
5- Simulation renewable energy models to study their characteristics and limitations.

2- Intended Learning Outcomes (ILOs)

Field	Program ILOs that the course contribute in achieving	Course ILOs
Knowledge&Understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	**A1-2-1** Discuss the basics differences between the traditional and non-traditional electrical energy resources. **A1-2-2** Understand the theories, basics of Photovoltaic cell. **A1-2-3** Understand the theories, basics of wind turbines. **A1-2-4** Understand the theories, basics of energy storge devices. **A1-2-5** Recognize the side effects of wind farms on the surrounding environment. **A1-2-6** Discuss the side effects of energy storage on the
Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	**B1-1-1** Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to sizing of PV systems.
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	**B2-1-1** Apply broad knowledge of modern computational methods to solve, to model and to analyze renewable energy problems.
Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of	**C1-1-1** Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using Matlab software.

specialization.	professional skills to solve engineering problems.	
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	**C3-1-1** Evaluate methods and tools reported in a specified published articles and researches related to maximum power tracking for wind turbines and PV.
General skills		
D4- Establish rules and indicators for assessing the performance of others.	D4-1 Design standards to evaluate others performance.	**D4-1-1** Prepare technical reports and present results on renewable energy**.**

3- Course Contents

Week No.	Topic	Total Hours	Contact hrs			Course ILOs Covered (By No.)
			Lec.	Tut.	Lab.	
Week-1	Sources of renewable energy, renewable energy and their applications, sources of electrical energy production, solar energy contribution to electrical supply, wind energy contribution to electrical supply.	3	3	-	-	A1-2-1 D4-1-1
Week-2	Solar radiation characteristics, solar cell(electronic structure of semiconductor), the illumination PN junction, the structure of solar cell, the equivalent circuit of solar cell, the characteristics of solar cell, the temperature and radiation effects on solar cell characteristics.	3	3	-	-	A1-2-2 C1-1-1
Week-3	Types of solar cell, Solar cell technology, manufacture of solar cells.	3	3	-	-	A1-2-2
Week-4	Structure of PV system (stand alone, grid connected),Power conditioning and control	3	3	-	-	A1-2-2
Week-5	Maximum power extraction algorithms for PV systems	3	3	-	-	B2-1-1 D4-1-1
Week 6-7	Sizing of stane alone PV systems	3	3	-	-	B1-1-1, B2-1-1, C1-1-1
Week-8	Economic of PV installation, Application of PV system, Environmental impacts of PV	3	3	-	-	B2-1-1 C1-1-1
Week-9	Basics of wind energy conversion, wind characteristics, wind velocity distribution, power conversion and rotor power characteristics and power coefficient.	3	3	-	-	A1-2-3 A1-2-1
Week 10	Wind turbines, basics wind turbines configurations, power and torque characteristics of wind turbines, and construction of horizontal axis.	3	3	-	-	A1-2-3 C1-1-1

Week-11	control and power limitation, control strategy to extract maximum power, types of over speed protection, wind speed extracted power curve,	3	3	-	-	B2-1-1 D4-1-1
Week-12-20	Students presentations					C3-1-1 D4-1-1
Week-21-24	Overview of wind energy systems, systems feeding into the grid, system for island supply.	3	3	-	-	B2-1-1
Week-25-26	Energy Storage Technologies, Overview of Storage Technologies Principal Forms of Stored Energy, Applications of Energy Storage Specifying Energy Storage Devices, Specifying Fuels.	3	3	-	-	A1-2-4 A1-2-2
Week-27-28	Direct Electric Storage, Electrochemical Energy Storage, Mechanical Energy Storage Direct Thermal Storage.	3	3	-	-	A1-2-4 C3-1-1

4- Relationship between the course and the Program

Field	Academic Reference Standard(ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving.	A1-2	B1-1 B2-1	C1-1 C3-1	D4-1

5- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	40%	60%				100%

6- Course Topics.

Topic No.	Topic	Weeks
1st	Types and scopes of the energy over the world.	1-5
2nd	Solar energy principles and photovoltaic system	6-10
3rd	Wind energy principle and applications	11-16
4th	Energy storages and applications	17-28

7- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics			
		1st	2nd	3rd	4th
Knowledge & Understanding	A1-2	x	x	x	x
Intellectual Skills	B1-1		x		
	B2-1		x	x	
Professional Skill	C1-1		x	x	
	C3-1			x	x
General Skills	D4-1	x	x	x	

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		14- Teaching and Learning Method:												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
K&U	A1-2-1	x			x									
	A1-2-2	x			x	x								
	A1-2-3	x			x	x								
	A1-2-4	x			x	x								
	A1-2-5	x			x	x								
	A1-2-6	x			x	x								
Intellectual Skills	B1-1-1	x			x	x								
	B2-1-1	x			x	x								
Professional Skills	C1-1-1	x			x	x								
	C3-1-1	x			x	x								
General Skills	D4-1-1									X				

9-Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these group of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

10- Assessment
10.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Disscussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	A1-2-1	x											
	A1-2-2	x		x									
	A1-2-3	x		x									
	A1-2-4	x		x									
	A1-2-5	x		x									
	A1-2-6	x		x									
Intellectual Skills	B1-1-1	x		x									
	B2-1-1	x		x									
Professional Skills	C1-1-1	x		x									
	C3-1-1	x		x									
General Skills	D4-1-1						x		x	x			

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

11- Facilities required for teaching and learning

A. laboratory Usage:

Null

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1- **Energy Conversion by Yogi Goswami, 2007**
2- **Fundemental of renewable energy processes by Aldo V.da Rosa   , 2005.**

Course Dr. Medhat Hegazy Elfar.

Program coordinator: Dr Azza El Desouky

Head of the Department: Prof. Dr. Samir Mohamed Elmakkawy

Date: /   /2019.

(EPM618)
Electric Drive (2)
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MSc
Date of specification approval	*August 2019*

A- Basic Information

Title:Electric Drive (2)		Code Symbol: **EPM 618**
Lecture	3 hours	
Tutorial	---------	
Laboratory	---------	
Total	3 hours	Bylaw 2000
Second term	prerequisite	Automatic control

B- Professional Information

1- Course Aims:

The aims of this course are to provide the Student, upon completing the Electrical Engineering Program, with the basic knowledge and understanding of the traction and power electronics for speed control and analyzing different breaking Methods of electronic drive systems.The student shall attain the above mentioned objectives efficiently under controlled guidance and supervision.

2- Course Objectives

1. Demonstration of the knowledge and understanding of the importance of traction systems.
2. Definition of the requirements of the traction systems and how can they be met.
3. Recognizably of the different types of breaking Methods of electronic drive systems.
4. Evaluation of the suitable traction machines for various traction systems.

3- Intended Learning Outcomes (ILOs)

Field	Program ILOs that the course contribute in achieving	Course ILOs
A. Knowledge and understanding		

A1- Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering.	a1-1-1 Recognize terms of traction systems
	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	**A1-2-1**-Understand the basic theories of DC and AC motors as a traction motor. **A1-2-2**-Understand the basic theories of switched reluctance and linear motors. **A1-2-3**-Understand the control methods of AC, DC, switched reluctance and linear motors in traction services. **A1-2-4**-Understand how to control electrical motors in starting, running and braking modes.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	**A2-1-1**-Discuss different methods to connect traction systems to the grid utility.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	**B1-1-1**-Analyze the motion of a train using speed time curves. **B1-1-2**-Analyze the speed time curves to calculate the energy consumption along the travel.
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	**B3-1-1**- Analyze and evaluate published articles in the field of electrical traction.

professional problems.		
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	**C1-1-1** Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using Matlab software.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	**C2-1-1**-Writing a professional report about electrical traction technology.
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	**C3-1-1** Evaluate methods and tools reported in a specified published articles and researches related to electrical traction systems.
D. General and transferrable skills		
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	**D5-1-1** Prepare technical reports and present results on control of electrical motors used in traction systems.

4- Course Contents

Week No.	Topic	Total Hours	Contact hrs			Course ILOs Covered (By No.)
			Lec.	Tut.	Lab.	
Week-1	Introduction - Purpose of the course - Course Scope	3	3	--	--	**A1-1-1** **A1-2-1** **D5-1-1**
Week-2	Traction system.	3	3	--	--	**A1-1-1** **A1-2-1** **C1-1-1**
Week-3	Speed time curves of traction system.	3	3	--	--	**B1-1-1** **B1-1-2**
Week-4	Electric traction motors.	3	3	--	--	**A1-2-1** **A1-2-2**

Week-5	Starting and braking.	3	3	--	--	**A1-2-3** **C2-1-1**
Week-6	Drive components.	3	3	--	--	**A1-2-4** **B3-1-1** **D5-1-1**
Week-7	Duty cycle and motor sizing.	3	3	--	--	**A1-2-1** **A1-2-2**
Week-8	Liner Induction motor.	3	3	--	--	**A1-2-2** **A1-2-3**
Week-9	Switched reluctance motor as traction motor.	3	3	--	--	**A1-2-2** **A1-2-4**
Week-10-15	DC motor temperature.	3	3	--	--	**A1-2-3**
Week-16-20	AC motor temperature.	3	3	--	--	**A1-2-4**
Week-21-28	Practical services and motor choice.	3	3	--	--	**A2-2-1** **C3-1-1** **D5-1-1**
	Total	36	36	--	--	*3 hrs Testing*

5- <u>Relationship between the course and the Program</u>

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programs Academic Standards that the course contribute in achieving	**A1-1** **A1-2** **A2-1**	**B1-1** **B3-1**	**C1-1** **C2-1** **C3-1**	**D5-1**

6- <u>Course Subject Area:</u>

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disscretionry subjects**	**Total**

---	---	40%	60%	---	---	---	100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction(Traction system Speed time curves of traction system)	1-3
2nd	Electric traction motors	4-5
3rd	Drive components	6-9
4th	Special machines	10-15
5th	Practical services and motor choice	16-28

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	A1-1	X	X	X	X	X
	A1-2	X	X	X	X	X
	A2-1					X
Intellectual Skills	B1-1	X	X			X
	B3-1		X	X		
Professional Skill	C1-1	X	X	X	X	
	C2-1		X		X	X
	C3-1	X		X	X	X
General Skills	D5-1	X	X	X	X	

9- Teaching and Learning Method:

Course Intended	Teaching and Learning Method

learning outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	A1-1	X		X	X					X				
	A1-2	X			X	X				X				
	A2-1	X		X	X	X								
Intellectual Skills	B1-1	X		X	X	X								
	B3-1	X			X	X								
Professional Skills	C1-1	X	X		X	X								
	C2-1	X			X	X					X			
	C3-1	X		X	X	X								
General Skills	D5-1		X	X	X									

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.

		Assign a teaching assistance to follow up the performance of these group of students.
For outstanding Students		Hand out project assignments to those students.
		Give them some research topics to be searched using the internet and conduct presentation.
		Encourage them to take parts in the running research projects.

11- Assessment
11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)			Assessment Methods												
			Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exam	Monitoring
Knowledge & Understanding		A1-1	X		X			X	X					
		A1-2	X		X			X	X					
		A2-1	X		X			X	X					
Intellectual Skills		B1-1	X		X			X	X					
		B3-1	X		X			X	X					
Professional Skills		C1-1	X		X			X	X	X				
		C2-1	X		X			X	X	X				
		C3-1	X		X			X	X					

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General Skills	D5-1								X	X			

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

12- Facilities required for teaching and learning

ı. laboratory Usage:

Null.

ɹ. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

13- List of references:

10- Hancock, N. N., "Electric Power utilization", Pitman Publishers, 1967.

11- Laithwaite , E.R, and Freris,L.L, "Electric Energy : its Transmission Generation an se",McGraw Hill Co 1984.

12- Hindmarash, J., (Electrical Machines and its application) PERGAMON PRESS 1984.

13- Murphy J.M.D., (Power Electronic Control of AC Motor), PERGAMON PRESS 1988.

Course prof: Dr. Mahmoud Fawzi

Program coordinator: Dr. Azza Ahmed Dessouki

Head of the Department: Prof. Dr. Samir Mohamed ElMakkawy

Date: /   /2019.

EPM 622
Selected Topics in Electrical Power and Machines
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	M.Sc.
Date of specification approval	*August 2019*

A- Basic Information

Title :Selected Topics in Electrical Power and Machines	Code Symbol: **EPM** 622	
Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

42- Course Aims:

This course is designed to extend basic concepts learned in renewable energy system. The aims of this course are to provide the Post graduate Student with the types of energy sources and the model of converters in microgrid power systems. This course will also enable students to recognize the smart power grid systems and how to design microgrid solar energy systems. The basic idea of the wind energy conversions and microgrid wind energy systems. It is also aimed that the student will get acquainted with the basic concepts of energy storage technologies and their applications.

43-   Course Objectives

10- Demonstration of the knowledge and understanding of the different types of renewable energy resourses and their applications.
11- Analysis the converters circuits used in microgrid power system.
12- Assessment the costs, reliablilty and environmental effect of microgrid power systems.
13- Demonstration of the knowledge and understanding of the basics of smart power grid systems.
14- Simulation renewable energy models to study their characteristics and limitations.

44- Intended Learning Outcomes (ILOs) for the whole program

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of	**A1-1-1** Discuss the basics differences between the traditional and non-traditional electrical energy resources.

practice.	mathematics and computer science appropriate to their areas of specialization in Electrical Power And Machines Engineering.	**A1-1-2** Understand the theories, basics of smart grid. **A1-1-3** Understand the theories, basics of Photovoltaic cell. **A1-1-4** Understand the theories, basics of wind turbines. **A1-1-5** Understand the theories, basics of energy storage devices.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and discuss the effect of global warming.
B. Intellectual skills		
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	B2-1-1 Apply broad knowledge of modern computational methods to solve, to model and to analyze renewable energy problems..
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to smart grid .
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical matters.	c2-1-1 Write and evaluate a professional report on microgrid.
D. General and transferrable skills		

D6- Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	d6-1-1 Demonstrate significantly enhanced group working abilities to implement a certain project.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about Smart grid and microgrid and its control.

45-   Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- **ENERGY AND CIVILIZATION**	12	12	--
2- **POWER GRIDS**	12	12	--
3- **CONVERTERS IN MICROGRID POWER SYSTEMS**	12	12	--
4- **SMART POWER GRID SYSTEMS**	12	12	--
5- **MICROGRID SOLAR ENERGY SYSTEMS**	18	18	--
6- **MICROGRID WIND ENERGY SYSTEMS**	18	18	--
Total	84	84	--

46-   Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	**A1 (a1-1), A2 (a2-1)**	**B2 (b2-1)**	**C1 (c1-1), C2 (c2-1)**	**D6 (d6-1), D8 (d8-1)**

47-   Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	**30%**	**70%**	**-**	**-**		**100%**

48-   Course Topics.

Topic No.	Topic	Weeks

1st	1- ENERGY AND CIVILIZATION	1-4
2nd	2- POWER GRIDS	5-8
3rd	3- CONVERTERS IN MICROGRID POWER SYSTEMS	9-12
4th	4- SMART POWER GRID SYSTEMS	13-16
5th	5- MICROGRID SOLAR ENERGY SYSTEMS	17-22
6th	6- MICROGRID WIND ENERGY SYSTEMS	23-28

49- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th
Course ILOs	**Knowledge & Understanding**					
a1-1-1	X					
a1-1-2				X		
a1-1-3					X	
a1-1-4						X
a1-1-5					X	
a2-1-1	X					
Course ILOs	**Intellectual Skills**					
b2-1-1			X	X	X	X
Course ILOs						
c1-1-1		X		X	X	X
c2-1-1		X	X			
Course ILOs						
d6-1-1			X	X		
d8-1-1				X	X	X

15- Teaching and Learning Method:

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x			x	x								
	a1-1-2	x			x	x								
	a1-1-3	x			x	x								
	a1-1-4	x			x	x								
	a1-1-5	x			x	x								
	a2-1-1		x	x					x	x				
Intellectual Skills	b2-1-1				x	x								
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x					
	d6-1-1		x							x				
	d8-1-1		x							x				

16- Assessment

9.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32th
Total	100%	

10- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

P. laboratory Usage:

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs.

Q. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:
  Lecture notes.
Essential Books (Text Books):
- **ALI KEYHANI**   "Design Of Smart Power Grid Renewable Energy Systems" , John Wiley&Sons.2011.

Recommended Books:
- **Gilbert M. Masters**., "Renewable and Efficient Electric Power Systems".   John Wiley&Sons.2004

Course Coordinator: **Dr. Medhat Hegazy Elfar**

Program Coordinator: **Dr. Azza Ahmed Dessouki**

Head of the Department: **Prof. Dr. Samir Mohamed Elmakkawy**

Date: / /2019

CCE 616

Advanced Computer Languages & Programming Course Specification

Course Specification

Program on which the course is given	**MS.C in Electrical Engineering (Specialization: Electrical Power and Machines Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**MS.C Preparatory Year**
Date of specification approval	**2013**

A- Basic Information

Title: Advanced Computer Language Programming	**Code Symbol: CCE 616**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course provides an introduction to the field of computer Programming, simulation and covers the Basics of Matlab programming Language, problem solving, and software engineering .The course aims to acquire the Post graduate students with the essential knowledge to understand the advanced of the computer programming. The course learns the student to write programs that allow numeric, character and work with single and multi-dimensional arrays. The process of opening, writing to and reading from and closing files is covered in this course.

2- Course Objectives

1- Demonstration of the knowledge and understanding of the advanced computer Programming.
2- Defination of the requirements of solving problems using Matlab Programming language..
3- Acquire the Post graduate students with the essential knowledge to understand the optimization using the Matlab toolboxes .
4- Analysis of different problems using Matlab simulation

3- Intended Learning Outcomes (ILOs) for the whole program

All (Power, Computer & control and Electronics & Communication) Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power and Machines Engineering.	a1-1-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic programming .
	a1-1-2 Classify the basic elementary math built-in functions
	a1-4-3 Classify the useful commands for managing variables
	a1-1-4 Demonstrate sufficient essential knowledge and a deep understanding to Matlab Programming .
	a1-1-5 Describe different effective techniques and program algorithms to analyze and design different engineering problems
	a1-1-6 Demonstrate sufficient essential knowledge and a deep understanding to the mathematical operation with arrays.
	a1-1-7 Explain the applications in numerical analysis programming for solving engineering problems.
	a1-1-8 Demonstrate a basic understanding of the optimization using the Matlab toolboxes
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power and Machines Engineering.	b1-1-1 Demonstrate algorithms and flowcharts approach (Problem solving) to solve problems related to electrical engineering problems.
	b1-1-2 Interpret, analyze & evaluate the information to solve problems using computer.

C. Professional and practical skills

C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating computer solutions related to electrical systems problems, using latest computer engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to Electrical Power and Machines technical matters	c2-1-1 Write and evaluate a professional report on computer programming in solving problems relevant to Electrical Power and Machines Engineering field.

D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer tools for solving professional problems related to electrical systems.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about computer programming.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about Matlab simulation tool boxes .

4. Course Contents

Week No.	*Topic*	*Lec. Hours*
Weeks 1 & 2	INTRODUCTION: -What is the computer - Computer specifications - Computer Components	6
Weeks 3 & 4	COMPUTER LANGUAGES: - Language Classifications -Compiler and Interpreter	6
Weeks 5 , 6,7&8	GENERAL PRINCIPLES OF PROGRAMMING: -Algorithms -Flowcharts -Mathematical model -Introduction to Matlab programming	12
Weeks 9 ,10, 11&12	The Fundamental of Matlab - Languages: - Data Types - Relational Operators - Logical Operators	12

	- Assignment Operators	
Weeks 13 ,14, 15 &16	DATA INPUT AND OUTPUT: 1-Introduction 2- Input Library Functions 3- Output Library Functions 4- Character arrays	12
Weeks 17,18, 19 &20	CONTROL STATEMENTS IN PROGRAMMING: 1-Introduction 2- The for Functions 3- The Nested for Function 4- The while Functions 5- The break , and continue functions 6- The if …then …. Else….end functions 7- The switch …. Case functions	12
Week 21,22 & 23	THE ARRAYS: 1-Introduction 2- The single dimensional numeric and character arrays 3- The Multi dimensional numeric and character arrays	9
Week 24 & 25	THE FUNCTIONS M-FILES 1-Introduction 2- Function Definition 3- Function Call 4- Examples of Function	6
Week 26, 27 & 28	THE FILES: 1-Introduction 2- Opening and Closing a file 3- Read and write functions OPTIMIZATION and SIMULINK TOOLBOXES. 1-Introduction to optimization 2- Basic properties of solutions and algoritms 3- Introduction to simulink 4- Solving problems in time based	9

4- <u>**Relationship between the course and the Program**</u>

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-1	B1-1	C1-1, C2-1	D2-1, D5-1, D8-1

5- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
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6- Course Topics.

Topic No.	Topic	Week
1st	Introduction, and Definations of computer systems	1-2
2nd	Introdution to computer languages. Design Algorithms and flowcharts.	3-4
3rd	Define the Data Types, Relational Operators, Logical Operators and Assignment Operators	5-8
4th	Define the Input Library Functions and Output Library Functions	9-12
5th	Define the control statements in programming	13-16
6th	THE ARRAYS: Creating the single and two dimensional numeric and character arrays Mathematical operation with Array	17-20
7th	Define The FUNCTIONS AND FUNCTION FILES Function Definition Line Input and Output Arguments Local and global variables	21-23
8th	OPTIMIZATION and SIMULINK TOOLBOXES. Define the optimization techniques Define the basic properties of solutions and algoritms Using simulink for Solving proplems in time based	24-28

7- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)	Course topics							
	1st	2nd	3rd	4th	5th	6th	7th	8th

Knowledge & Understanding	a1-1-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic programming .	X	X						
	a1-1-2 Classify the basic elementary math built-in Functions.	X	X						
	a1-1-3 Classify the useful commands for managing variables.	X	X	X					
	a1-1-4 Demonstrate sufficient essential knowledge and a deep understanding to Matlab Programming .	X	X	X					
	a1-1-5 Describe different effective techniques and program algorithms to analyze and design different engineering problems	X	X	X	X				
	a1-1-6 Demonstrate sufficient essential knowledge and a deep understanding to the mathematical operation with arrays.	X	X	X	X	X			
	a1-1-7 Explain the applications in numerical analysis programming for solving engineering problems.						X	X	X
	a1-1-8 Demonstrate a basic understanding of the optimization using the Matlab toolboxes .						X	X	X
Intellectual Skills	b1-1-1 Demonstrate algorithms and flowcharts approach (Problem solving) to solve problems related to electrical engineering problems.	X	X						
	b1-1-2 Interpret, analyze & evaluate the information to solve problems using computer.		X	X					

Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating computer solutions related to electrical systems problems, using latest computer engineering techniques, skills, and tools.							x	x	
	c2-1-1 Write and evaluate a professional report on computer programming in solving problems relevant to Electrical Power and Machines Engineering field.							x	x	x
General Skills	d2-1-1 Use state-of-the-art computer tools for solving professional problems related to electrical systems.									x
	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about computer programming.								x	x
	d8-1-1 Exhibit the ability to learn more about Matlab simulation tool boxes .								x	x

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method (The teaching process will be done inside the computer Lab)												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Computer Simulation	Playing
Knowledge & understanding	a-1-1-1	x				x								
	A1-1-2	x				x							x	
	a-1-1-3	x				x							x	

	a-1-1-4	x				x						x	
	a-1-1-5	x				x						x	
	a-1-1-6	x				x						x	
	a-1-1-7	x				x						x	
	a-1-1-8	x				x						x	
Intellectual Skills	b1-1-1					x						x	
	b1-1-2					x						x	
Professional Skills	c-1-1-1					x						x	
	c-2-1-1					x						x	
General Skills	d-2-1-1					x			x			x	
	d-5-1-1					x			x			x	
	d-8-1-1					x			x			x	

9- Assessment
10.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College
Total	100%	Council

11- Facilities required for teaching and learning

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the class and/or at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course Notes: NONE

Text Books:
1) Amos Gilat, Matlab An introduction with Applications (2nd ed.) John Wiley & Sons, Inc,2005

2) Knuth, D., The Art of Computer Programming, vol. I: Fundamental Algorithms (2nd ed.). MA: Addison-Wesley, 1973

Recommended Books:
1) Amos Gilat, Matlab An introduction with Applications (2nd ed.) John Wiley & Sons, Inc,2005

13- <u>Program Coordination Committee:</u>

Course Coordinator:	**Associate Prof. Dr. Gamal Abdelazim Mahmoud**
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Date: / /2019.

SCI 603

Higher Mathematics Course Specification

Course Specification

Program on which the course is given	**MS.C in Electrical Engineering (Specialization: Electrical Power and Machines Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Physics and Mathematical Engineering**
Academic year/Level	**MS.C Preparatory Year**
Date of specification approval	**2013**

A- Basic Information

Title: Higher Mathematic	Code Symbol: SCI 603	
Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course aims to equip the student with the essential knowledge and stimulate intuitive understanding of some basic concepts and methods of Statistics.

2- Course Objectives:

By the end of the course the students will be able to:
1. Apply the basics and the methodologies of Mathematics and to use its different tools
2. Combine some applications of the Mathematical knowledge with relevant knowledge in the professional practice.
3. Recognize an appropriate range of Mathematical professional skills and the use of appropriate technology tools to serve professional application.

3- Intended Learning Outcomes (ILOs):

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electrical Power and Machines Engineering	a1-1-1 Demonstrate sufficient essential knowledge and a deep understanding of the concepts and theories of Vector analysis Calculus of variation appropriate to Electrical Power and Machines Engineering field.
	a1-1-2 Discuss the boundary and generating functions.
	a1-1-3 Demonstrate sufficient essential knowledge to understand how to solve of systems of linear differential equations.
	a1-1-4 Recognize Fourier integral applied to ordinary and partial differential equations.
	a1-1-5 Demonstrate sufficient essential knowledge to understand how to do Tensor analysis.
	a1-1-6 Illustrate how to solve Integral equations.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power and Machines Engineering.	b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, and analyzing, engineering problems pertaining to professional research practice in Electrical Power and Machines Engineering field.

4- Course Contents:

No.	Topic	Total hours	Lec. hours
1	Vector analysis	12	12
2	Calculus of variation	9	9
3	Boundary functions	12	12
4	Systems of Linear differential equations	9	9
5	Fourier integral applied to ordinary and partial differential equations	9	9

6	Tensor Analysis	12	12
7	Generating functions	12	12
8	Integral equations	9	9
	Total	84	84

5- Relationship between the course and the program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-1	B1-1	---	-----

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
	100%						100%

7- Course Topics.

Topic No.	Topic	weeks
1	Vector analysis	1-4
2	Calculus of variation	5-7
3	Boundary functions	8-11
4	Systems of Linear differential equations	12-14
5	Fourier integral applied to ordinary and partial differential equations	15-17
6	Tensor Analysis	18-21
7	Generating functions	22-25
8	Integral equations	26-28

8- <u>ILOs Matrix Topics</u>

Course Intended Learning Outcomes (ILOs)		Course topics							
		1st	2nd	3rd	4th	5th	6th	7th	8th
Knowledge & Understanding	a1-1-1 Demonstrate sufficient essential knowledge and a deep understanding of the concepts and theories of vector analysis and calculus of variation appropriate to Electrical Power and Machines Engineering field.	x	x						
	a1-1-2 Discuss the boundary and generating functions.			x				x	
	a1-1-3 Demonstrate sufficient essential knowledge to understand how to solve of systems of linear differential equations.				x				
	a1-1-4 Recognize Fourier integral applied to ordinary and partial differential equations.					x			
	a1-1-5 Demonstrate sufficient essential knowledge to understand how to do Tensor analysis.						x		
	a1-1-6 Illustrate how to solve Integral equations.								x
Intellectual Skills	b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, and analyzing, engineering problems pertaining to professional research practice in Electrical Power and Machines Engineering field.	x	x	x	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Computer Simulation	Playing
Knowledge & understanding	a-1-1-1	x				x								
	a-1-1-2	x				x								
	a-1-1-3	x				x								
	a-1-1-4	x				x								
	a-1-1-5	x				x								
	a-1-1-6	x				x								
Intellectual Skills	b1-1-1			x		x								

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	Week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Whiteboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students are encouraged to use library technical resources in the studying of the course.

12- List of references:

Mathematics for Engineers: A Modern Interactive Approach, Anthony Croft, Tony Croft, Robert Davison, Pearson/Prentice Hall, 2008.

13- <u>Program Coordination Committee:</u>

Course Coordinator:	**Dr. Hewayda El Ghawalby**
Program coordinator:	**Dr. Azza Ahmed Dessouki**
Head of the Department:	**Prof. Dr. Samir Mohamed ElMakkawy**

Updated Date: / /2019.

Master of Science

Thesis

Specification

Thesis Specification

Program on which the thesis is given	MS.C in Electrical Engineering (Specialization: Electrical Power And Machines Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	*August 2019*

A- Basic Information

Title: Thesis	Code Symbol: Without	
Lecture	Independent but regular contacts with the supervisor is required	
Tutorial / Laboratory	Independent	
Total	At least 2 years	Bylaw 2000

B- Professional Information

1- Thesis Aims:

The Master's Thesis is an independent project (degree project) to develop and display the skills and abilities of the student to carry out individual, independent scientific work on a specific topic, exploring it in a trans-disciplinary manner, and assessing solutions and conclusions with respect to the different dimensions of sustainability. It does not aim to provide additional substantive material or methodological toolkit, the way typical graduate courses do. Its goal is rather modest as it attempts to apply student cumulative understanding and skills to specific research situation. From the perspective of one's program of study, however, the thesis phase poses a real-world test helping to make a realistic transition from coursework to dissertation. Completing a dissertation successfully is the last and often most challenging part of master studies. The goal is to put one's theoretical knowledge and research proficiency to practical test by carrying out an independent, albeit guided, project producing an original piece of research and making a significant contribution to solving a problem and expanding the knowledge base in the specific discipline. While research is an ongoing process, in which one is expected to stay on top of the relevant developments in the discipline, the assumption is that students are capable of thinking through the important milestones in the dissertation process and developing a dissertation prospectus that spells out the core concepts and questions as well as the designs of research and the structure of intended dissertation. The overall aim of the thesis phase is that the students should further develop and enhance their ability to independently plan, conduct and report on a research project which makes a contribution to the current state-of-the-art in the area. Also, the student should exhibit ability to in detail, creatively, with a high level of clarity and authority, using scientific scrutiny and adequate tools identify, explain, analyze and assess issues pertinent to a MS.c thesis in the research field, within which the thesis project

is placed. On balance, a successful completion of the thesis phase is marked by student ability to do the following:

1. Apply his/her theoretical and methodological understanding and skills into devising researchable ideas and specific research questions and hypotheses,

2. Conduct a focused review of the relevant literature and create appropriate conceptual framework,

3. Develop a realistic research design with specific research strategies,

4. Communicate research ideas and their appropriate theoretical and methodological issues effectively and efficiently,

5. Gain understanding of the process of dissertation including stress, time, and project management, committee formation, dissertation proposition and defense, and human subjects reviews.

6. Develop and execute his/her survey to collect the necessary data to prove / support the problem that he has set up.

7. Identify own knowledge needs with respect to the planned project.

8. Write theses and report on research projects in a scientifically sound way.

9. Describe what the contribution of his/her thesis is and relate it to the current state-of-the-art within one or several international knowledge communities within the discipline

10. State the threats against and argue for the validity of her/his research methods, and in doing so, show awareness of that the concept of validity may have different values and be used in different ways within qualitative and quantitative research approaches.

11. Analyze a master's thesis in a constructively critical way and identify the major strong and weak points of the thesis.

12. Describe how and where he/she has searched for, and why he/she has probably found the most relevant related work.

2- <u>Intended Learning Outcomes (ILOs) for the whole program</u>

The thesis is designed to achieve the above objectives through the following **Intended Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Thesis ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	a1-2-1 Demonstrate profound knowledge and understanding of the thesis topic, especially in relation to the different dimensions of sustainability, and to previous and current research in the field, and relating it to a wider perspective. a1-2-2 Demonstrate deeper methodological knowledge and understanding of system analysis approaches to the environmental and

		sustainability issues in the thesis, and of research methodology suitable to identify more sustainable solutions to the problems addressed in the thesis.
A2- Mutual influence between professional practice and its impacts on the environment.	A2-1 Discuss mutual influence between professional practice of Electrical Power And Machines technologies and its impacts on the environment.	a2-1-1 Report and Discuss mutual relation between professional social aspects of his/her research and its effects on the Environment. a2-1-2 Recognize the interaction between his/her research and surrounding environment.
A3- Main scientific advances in the field of specialization.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to Electrical Power And Machines Engineering issues.	a3-1-1 Classify the Potential applications of his/her research and its value in relation to contemporary research issues. a3-1-2 Describe what the contribution of his/her thesis is and relate it to the current state-of-the-art within one or several international knowledge communities within the discipline. a3-1-3 Report the new advances in analysis and design methodologies related to his/her research issues. a3-1-4 Discuss the recent and update developments in the most important themes related to his/her research issues.
A4- Fundamentals of ethical & legal professional practice in the field of specialization.	A4-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field of Electrical Power And Machines Engineering.	a4-1-1 Describe and explain principles for ethical considerations in relation to scientific research. a4-1-2 Demonstrate an ability to make assessments regarding sustainability problems while taking into account relevant scientific, social and ethical aspects, and demonstrate an awareness of ethical aspects of research and development work thereby demonstrating insight into the potential and limitations of knowledge and science to solve sustainability problems.
A5- Basics and principles of quality in professional practice in	A5-1 Explain quality assurance concepts of different Electrical Power And Machines components and	a5-1-1 Explain Quality Assurance concepts of different microwave communication systems

	systems development phases.	development phases
the field of specialization.		
A6- Basics and ethics of scientific research.	A6-1 Recognize basics and ethics of scientific research.	A6-1-1 Demonstrate insights into ethical aspects on research in general.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining to to a M.SC thesis, as well as the courses that affect his/her professional research practice in Electrical Power And Machines Engineering.	b1-1-1 Identify and formulate a problem from a scientific perspective, collect data or use already collected empirical data, and demonstrate skills and ability to perform analyses related to the scientific problem.
B2- Solve specific problems on the basis of limited and contradictory information.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to Electrical Power And Machines Engineering.	b2-1-1 Apply his/her theoretical and methodological understanding and skills into devising researchable ideas and specific research questions and hypotheses and to formulate judgments with incomplete data.
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Integrate, critically and systematically, theoretical knowledge and empirical data, using appropriate research methods and properly handling uncertainties, thereby contributing to the production of knowledge. b3-1-2 Demonstrate an ability to integrate knowledge and handle complexity, and to formulate judgments with incomplete data.

B4- Conduct a research study and/or writing systematic scientific study on Research problem.	B4-1 Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	b4-1-1 Demonstrate an ability to critically, independently and creatively identify and formulate a realistic research plan with specific research strategies for his applied research and specifying steps and timelines. b4-1-2 Demonstrate ability to independently conduct an applied research project on industrial and societal concerns problems related to the field of Electric Power Engineering science.
B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in Electrical Power and Machines Engineering	b5-1-1 Analyze a master's thesis in a constructively critical way and identify the major strong and weak points of the thesis.
B6- Plan to imporove performance in the field of of specialization.	B6-1 Plan to improve performance in the field of Electrical Power And Machines Engineering.	b6-1-1 Demonstrate an ability to identify his/her need of further knowledge and to take responsibility for developing such knowledge through a plan to guide progress in his / her professional career.. b6-1-2 Assess and argue for the relevance of the findings with regard to practical implications, and identify the need for further knowledge within the field.
B7- Take professional decisions in different professional practical contexts.	B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development Electrical Power And Machines systems.	b7-1-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development his/her research plan.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Demonstrate the ability to identify and formulate a problem from a scientific perspective, collect data or use already collected empirical data, and demonstrate skills and ability to perform analyses related to the scientific problem.
C2- Write and evaluate technical and professional reports.	C2-1 Write and evaluate a professional technical report pertaining to Electrical Power And Machines technical	c2-1-1 Write theses and report on research projects in a scientifically sound way.

		matters.
		c2-1-2 Conduct a focused review of the relevant literature and create appropriate conceptual framework,
C3- Evaluate means and tools available in the field of practice.	C3-1 Evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to his/her research topic in Electrical Power And Machines Field.	c3-1-1 Analyze and evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to electrical Power and machines field in a constructively critical way and identify the major strong and weak points of them.

D. General and transferrable skills

D1- Communicate effectively in different aspects.	D1-1 Express professional and communication skills effectively in different aspects.	d1-1-1 Communicate research ideas and their appropriate theoretical and methodological issues effectively and efficiently,
		d1-1-2 Demonstrate the ability to communicate results both verbally and in writing.
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving electrical Power and machines engineering problems.
D3- Adopt self-assessment and specify the needs of personal learning.	D3-1 Apply self evaluation and specify his educational needs related to Electrical Power And Machines aspects.	d3-1-1 Identify own knowledge needs with respect to the planned project.
D4- Establish rules and indicators for assessing the performance of others.	D4-1 Design standards to evaluate others performance.	d4-1-1 Demonstrate ability to critically evaluate other people's performance in a systematic and standard way.
D5- Use different sources to obtain knowledge and information.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to develop and execute his/her survey to collect the necessary data to prove / support the problem that he/she has set up.
D6- Collaborate effectively within multidisciplinary team and lead teams in different professional	D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	d6-1-1 Demonstrate significantly enhanced group working abilities to implement a certain project.

contexts.		
D7- Demonstrate a high level of competence in the time management.	D7-1Demonstrate a high level of competence in the time management.	d7-1-1 Manage time and work to deadlines. d7-1-2 Develop a workable weekly schedule based on his/her individual thesis direction. d7-1-3 Gain understanding of the process of dissertation including stress, time, and project management, committee formation, dissertation proposition and defense, and human subjects reviews.
D8- Learn independently and seek continuous learning.	D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Express a strong foundation of continuous learning so they can maintain their technical competency.

3- <u>Thesis Phases:</u>

The Master's Thesis is an independent project (degree project) to develop and display the skills and abilities of the student to carry out individual, independent scientific work on a specific topic. The readings for the thesis work are selected by the individual student in collaboration with the supervisor. **The Master's Thesis phases can be outlined as follow:**

1. Developing a thesis proposal by formulating a realistic research plan with specific research strategies and specifying steps and timelines

2. Identify and construct a problem/thesis statement.

3. Presentation and defending of self-authored materials describing the thesis proposal at a seminar with external discussants (Department Staff).

4. Conduct a focused review of the relevant literature and create appropriate conceptual framework.

5. Analyze and evaluate methods and tools reported in a specified published articles and researches concerning the thesis problem in a constructively critical way and identify the major strong and weak points of them.

6. Carry out research:

   - Use state-of-the-art computer aided design tools.
   - Provide practical and/or laboratory services that can help.

7. Analysis and discussion of the simulated / practical results.

8. Developing defensible conclusions.

9. Writing the final thesis.

10. Presentation and defending of self-authored materials describing the thesis at a seminar with external discussants (Department Staff).

11. Reporting on and presenting the thesis in a final defense. At the examination seminar, the student should be able to respond to criticism given and also act as an opponent.

- The thesis work also includes a number of thesis workshop sessions in advance, where research and writing methods are discussed, and where the individual initial drafting of the thesis scope and outline is discussed.
- Throughout these phases:

  ➢ The academic supervisor helps and guides the students.
  ➢ The student is to write a manuscript in the format of a scientific article to be published.
  ➢ Documentation is carried out.

4- Relationship between the course and the Program

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1 (a1-2), A2 (a2-1), A3 (a3-1), A4 (a4-1), A5 (a5-1), A6 (a6-1)	B1 (b1-1), B2 (b2-1), B3 (b3-1), B4 (b4-1) B5 (b5-1), B6 (b6-1), B7 (b7-1)	C1 (c1-1), C2 (c2-1), C3 (c3-1)	D1 (d1-1), D2 (d2-1), D3 (d3-1), D4 (d4-1), D5 (d5-1), D6 (d6-1), D7 (d7-1), D8 (d8-1)

5- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	-	-	-	100		100%

6- Learning and Teaching Methods:

Besides proposing, planning, conducting and presenting one's own master thesis project, the student is required to read, analyze and evaluate methods and tools reported in a specified published articles and researches concerning the thesis problem in a constructively critical way and identify the major strong and weak points of them and write an opponent report about it. The supervisor supports and supervises the student throughout the entire thesis project, but it is the student who must take on the responsibility of requesting support and supervision during the on-going project. The student is expected to report to her/his supervisor at least every four weeks. Besides this, the student is required to hand in a written progress report at least every three months. One or several lectures or seminars held by internal guest researchers, and focusing on research methods and the art of presenting research results, are arranged during the thesis development. In-seminar discussions should be enhanced with additional student-advisor (and committee, if appropriate) meetings. Students are expected to be prepared for all seminar meetings. It is mandatory for the student to have regular contacts with the supervisor so that the supervisor is able to follow the student's work process to secure the progress and the quality of the work. The thesis work also includes a number of thesis workshop sessions in advance, where research and

writing methods are discussed, and where the individual initial drafting of the thesis scope and outline is discussed.

7- <u>Assessment Methods:</u>

7.1 Assessment is carried out by evaluating of the student ability to clearly present the thesis orally and to discuss and defend the conclusions and the knowledge and arguments behind them, in a dialogue with examiner committee.

7.2 For a passing grade the student must (a) make an acceptable oral presentation of the thesis; (b) perform an acceptable defense of the thesis and should be able to respond to criticism given by the examiner committee and also act as an opponent.

8- <u>Facilities required for teaching and learning</u>

Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab – Specialized electrical Power and machines Lab - Library.

A. laboratory Usage:

Students are expected to prepare and conduct some computer simulation and practical works using computer ad specialized electrical Power and machines Labs.

B. Library Usage:

Students should be encouraged to use library technical resources during the thesis development.

9- <u>List of References:</u>

The readings for the thesis work are selected by the individual student in collaboration with the supervisor.

10-   <u>Program Coordination Committee:</u>

Program coordinator: **Dr. Azza Ahmed El Desouky**

Head of the Department: **Prof. Dr. Samir Mohamed ElMakkawy**

Date: /   /2019.