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Shoubra  
Faculty of  
Engineering

# Model No.12

## Course Specifications : Analysis of Electrical Power Systems

Alfarabi for Quality Assurance and Accreditation System - at 16/2/2014 4:55 PM

**University :** Benha university

**Faculty :** Shoubra Faculty of Engineering

**Department :** Electrical Engineering Department

### 1- Course Data

Course Code: EPE444      Course Title : Analysis of Electrical Power Systems      Study Year : Fourth Year

Specialization :

Teaching Hours:

Lecture : 2

Tutorial : 2

Practical :

Date of specifications approval: 20/6/2010

### 2- Course Aim

For students undertaking this course, the aims are to:

- 2.1- Ability to model, simulate, and analyze simplified power system as effected by different steady-state and abnormal conditions.
- 2.2- Demonstrate electric power computations techniques in power system circuits.
- 2.3- Ability to study the effect, and propose mitigation techniques for some problems related to power system.

### 3- Intended Learning Outcomes of Course (ILOS)

#### a- Knowledge and Demonstrate

On completing this course, students will be able to:

- a- 1 -Demonstrate of per-unit system calculations and single line diagram along with its associated impedance diagram (a-1)
- a- 2 -Demonstrate how to modify the bus impedance matrix and how to build it directly (a-2)
- a- 3 - Concept of simplified system (a-3)
- a- 4 - Concept of power flow problem (a-4)
- a-5-the Gauss-Seidel iterative procedures for solving power flow problem (a-5)
- a- 6 - Concept of power system economic operation (a-6)
- a- 7 - Demonstrate of electric power network behavior through three phase short circuit (a-7)
- a- 8 – Apply Concept of computer analysis of power systems (a-8)
- a- 9 – Use concept of symmetrical components and network sequences (a-9)

#### b- Intellectual Skills

At the end of this course, the students will be able to:

- b-1-Ability to select appropriate models for a given problem to be studied (b-1)
- b- 2 - Ability to select a suitable mathematical techniques for analysis of power systems for different parameters, operating, and steady-state conditions (b-2)
- b- 3 - Ability to identify acceptable solutions of problems of problems based on physical and operational limits of power system components (b-3)
- b- 4 - Ability to correlate between a solution based methods to the power system state problem (b-4)

b- 5 - Ability to select a suitable network configurations according to power system problem (b-5)

b- 6 - Ability of apply a mathematical procedures to electric power systems (b-6)

### c- Professional Skills

On completing this course, the students are expected to be able to:

c- 1 - Ability to model the basic elements of power systems (c-1)

c- 2 - Ability to perform steady-state analysis of simplified electric power systems (c-2)

c- 3 - Ability to perform analysis of simplified power systems through three-phase short circuit by utilizing Z bus (c-3)

c- 4 - Ability to perform load flow analysis (c-4)

c- 5 - Ability to perform numerical solution of non-linear equations representing simplified power systems in steady-state to solve power flow problem (c-5)

c- 6 - c.6) Using and writing codes using some high level programming languages used in electric engineering such as MATLAB (c-6)

c- 7 - Ability to direct determination of bus impedance matrix (c-7)

c- 8 - Ability to deal with the unbalanced network and how to draw sequences network (c-8)

## 4- Course Contents

Week No.	Topic	No. of hours	ILOs	Teaching/learning methods and strategies	Assessment method
1	Network representation and per unit system and load flow study	4	a1,b1,c1	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
2	Network representation and per unit system and load flow study	4	a1,b1,c1	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
3	Network representation and per unit system and load flow study	4	a1,b1,c1	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
4	The impedance model and network calculations	4	a1,a4,a5,a8,b1,b2,b3,b5,b6,c1,c2,c4,c5,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
5	The impedance model and network calculations	4	a1,a4,a5,a8,b1,b2,b3,b5,b6,c1,c2,c4,c5,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
6	Symmetrical short circuit analysis	4	a1,a2,a3,a8,b2,b4,b6,c1,c2,c6,c7	Presentation board, computer and data show	Home Assignments, Quizzes, Oral Exam

7	Symmetrical short circuit analysis	4	a1,a2,a3,a8,b2,b4,b6, c1,c2,c6,c7	Classroom, computer and data show	Home Assignments, Quizzes, Oral Exam
8	Mid-term exam				
9	The impedance model and network calculations	4	a1,a7,a8,b1,b2,b5,b6, c3,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
10	The impedance model and network calculations	4	a1,a7,a8,b1,b2,b5,b6, c3,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
11	Power system economic operation	4	a1,a2,a3,a5,a6,b1,b2,b3,b5,b6, c1,c2,c5,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
12	Power system economic operation	4	a1,a2,a3,a5,a6,b1,b2,b3,b5,b6, c1,c2,c5,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
13	Symmetrical components and network sequences	4	a1,a2,a3,a5,a6,b1,b2,b3,b5,b6, c1,c2,c5,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
14	Symmetrical components and network sequences	4	a1,a2,a3,a5,a6,b1,b2,b3,b5,b6, c1,c2,c5,c6	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
15	Final exam				
16					

### 5- Teaching and Learning Methods

- 5.1- Modified lectures
- 5.2- Class activity
- 5.3- Case study
- 5.4- Assignments / homework

### 6- Teaching and Learning Methods of Disables

- 6.1- None

### 7- Student Assessment

#### a- Student Assessment Methods

1	Reports to assess knowledge, intellectual, and professional and practical skills.
2	Quiz to assess knowledge, intellectual and professional skills.
3	Mid-term exam to assess knowledge, intellectual, and professional and practical skills.
4	Mid-term exam to assess knowledge, intellectual, and professional and practical skills.
5	Final exam to assess most ILOs.

#### b- Assessment Schedule

No.	Assessment	Week
1	Assessment 1	2, 5, 9, 11
2	Quizzes	4, 6, 10, 12
3	Mid-term exam	8
4	Final exam	15

**c- Weighting of Assessments**

Assessment	Weight
Mid_Term Examination	15 %
Final_Term Examination	70 %
Oral Examination	0 %
Practical Examination	0 %
Semester work	05 %
Other types of assessment	10 %
Total	100 %

**8- List of References**

**a- Books**

- 1- Handed out to the students part by part.
- 2- A textbook of power system analysis by Willim D. Stevenson, 1994
- 3- A textbook of Elements of power system analysis by Willim D. Stevenson, 1975
- 4- A textbook of Elements of power system analysis by Willim D. Stevenson, 1975
- 5- A textbook of Power Systems Engineering by R. K. Rajput, 2007

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Shoubra  
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## Model No.11A

### Course Specifications : Analysis of Electrical Power Systems

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**University :** Benha university

**Faculty :** Shoubra Faculty of Engineering

**Department :** Electrical Engineering Department

**Matrix of Knowledge and Skills of the course**

No.	Topics	Hrs	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Network representation and per unit system	4	a1, b1, c1			
2	Load flow study	4	a1,a4	b1,b5	c1,c2	
3	Load flow study	4	a4,a5	b2,b3	c4,c5	
4	Load flow study	4	a8	b6	c6	
5	The impedance model and network calculations	4	a1, a2,a3	b2, b4	c1,c2	
6	The impedance model and network calculations	4	a2, a8	b6	c6, c7	
7	Symmetrical short circuit analysis	4	a1, a7	b1, b2	c3	
8	Midterm Exam					
9	Symmetrical short circuit analysis	4	a8	b5, b6	c3,c6	
10	Power system economic operation	4	a1, a6	b1	c1	
11	Power system economic operation	4	a1, a8	b2,b5	c2	
12	Power system economic operation	4	a3, a6	b3,b6	c5, c6	

13	Symmetrical components and network sequences	4	a1, a9	b1, b2	c8	
14	Symmetrical components and network sequences	4	a1,a8	b5,b6	c6,c7	
15	Final Exam					

### Matrix of final exam questions and ILO's

**Course Title:** Analysis of Electrical Power Systems

**Code:** EPE444

**Lecture:** 2

**Tutorial:** 2

**Practical:** 0

**Total:** 4

**Program on which the course is given:** B.Sc. in Electrical Engineering (Power)

**Major or minor element of program:** Department offering the program: Minor

**Department offering the course:** Electrical Engineering Department

**Academic year / level:** Fourth Year/First Semester. **Date of specifications approval:**

20/6/2010

**Course instructor:** Associated Prof. Dr. Mohamed Shebl Mohamed El Bages

**External evaluator:** Prof. Dr.

Question	ILO a's									ILO b's						ILO c's								
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	1	2	3	4	5	6	7	8	
Network representation and per unit system and load flow study	✓									✓						✓								
The impedance model and network calculations	✓			✓	✓			✓		✓	✓	✓		✓	✓	✓	✓		✓	✓	✓			
Symmetrical short circuit analysis	✓	✓	✓					✓			✓		✓		✓	✓	✓					✓	✓	
The impedance model and network calculations	✓						✓	✓		✓	✓			✓	✓			✓				✓		
Power system economic operation	✓		✓			✓		✓		✓	✓	✓		✓	✓	✓	✓				✓	✓		
Symmetrical components and network sequences	✓							✓	✓	✓	✓			✓	✓							✓	✓	✓

**Matrix of assessment methods and ILO's**

**Course Title:** Power System Analysis

**Code:** EP444

**Lecture:** 2

**Tutorial:** 2

**Practical:** 0

**Total:** 4

**Program on which the course is given:** M.Sc. in Electrical Engineering (Power)

**Major or minor element of program:** Department offering the program: Minor

**Department offering the course:** Electrical Engineering Department

**Academic year / level:** Fourth Year/ Second Semester. **Date of specifications approval:**

20/6/2010

**Course instructor:** Dr. Mohamed Shebl Mohamed El Bages

**External evaluator:** Prof. Dr.

Question	ILO a's									ILO b's						ILO c's							
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	1	2	3	4	5	6	7	8
Assignments	✓									✓						✓							
Quizzes	✓			✓	✓			✓		✓	✓	✓		✓	✓	✓	✓		✓	✓	✓		
Reports	✓	✓	✓					✓			✓		✓		✓	✓	✓					✓	✓
Mid-term exam	✓						✓	✓		✓	✓			✓	✓			✓				✓	
Final exam	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**Course coordinator:** Dr. Mohamed Shebl Mohamed El Bages

**Course instructor:** Dr. Mohamed Shebl Mohamed El Bages

**Head of department:** Prof. Dr. Sayed A. Ward