Electrical Engineering Department
College of Engineering
First Semester (211)

EE 463 Course Syllabus

Course code	Title	Credit Hour
EE 463	**Power System Analysis**	**3-0-3**

Instructor:	Dr. Houssem Rafik El-Hana BOUCHEKARA
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Lab Instructor:	-

Office Hours:

Sunday	Monday	Tuesday	Wednesday	Thursday
02:00-02:50 PM	11:00-11:50 AM 01:00-01:50 PM	11:00-11:50 AM 01:00-01:50 PM	11:00-11:50 AM	01:00-01:50 PM

*Or by appointment

Lecture/Lab Information

Lecture	Lab
Location: online	**Location:** -
Time: 10:00 – 10:40 AM (Sunday) 09:00 – 09:50 AM (Tuesday)	**Time**: -

Designation: Required

1. Course Description

The basic concepts: representation, equivalent circuits. Per unit system. Power flow analysis. Short circuit analysis. Stability Analysis. Use of power system simulation packages.

2. Textbook and References

Hadi Saadat, Power System Analysis, PSA Publishing LLC, 3rd edition (2011).

Laboratory manual: -

References

i. J. Duncan Glover and Mulukutla S. Sarma "Power System Analysis and Design 4th edition", CL Engineering; 4 edition 2007.
ii. T. J. Overbye, J. D.Glover, M. S. Sarma, Power System Analysis and Design, CENGAGE Learning Custom Publishing, 6th Edition, 2016.

iii. V. K. Mehta, R. Mehta , Principles of Power System, S Chand & Co Ltd, 3rd Edition, 2005.
iv. John J. Grainger., William D. Stevenson, JR. Power System Analysis. New York: Mc Graw-Hill Inc, Edition 1997.

3. Prerequisite

EE 360 Electric Energy Engineering

4. Course Objectives

- ✓ The main goal of this course is to provide students with a complete overview of interconnected power system operation.
- ✓ At the completion of the course students should be able to develop appropriate models for an interconnected power system, and know how to perform power flow, short circuit analysis and transient stability studies.
- ✓ Students should also be able to study the operation of interconnected power system using digital computers.

5. Course Outcomes

After completing this course, the student will be able to:

I. Identify, formulate, and solve complex problems related to power systems involving power flow analysis, short circuit analysis and stability analysis by applying principles of engineering, science, and mathematics.
II. Apply engineering design of power system components to produce solutions that meet specified needs and constraints.
III. Communicate effectively with a range of audiences by presenting a term project related to power system analysis.
IV. Recognize professional responsibilities while analyzing the operation of power systems and make informed judgments, considering the impact of engineering solutions in global and economic contest.
V. Acquire and apply new knowledge as needed, and modern engineering tools such as MATLAB, PowerWorld and ETAP to analyze and design power systems for an efficient, optimal and secure power system.

6. Mapping Between Course Outcomes and Student Outcomes

Student outcomes / Course outcomes	1	2	3	4	5	6	7
I	X						
II		X					
III			X				
IV				X			
V							X

7. Major Topics Covered in the Course

No.	Content	Chapter	Contact Hours
1	Introduction and basic concepts	1	4
2	Per unit representation and equivalent circuits	2	4
3	Network calculation	3	3
4	Power flow analysis	4	8
5	Symmetrical components	5	2
6	Sequence networks	6	4
7	Symmetrical faults analysis	7	3
8	Unsymmetrical faults analysis	8	6
9	Transient stability	9	9
10	Power system modeling and simulation using PowerWorld	10	5

8. UOHB Rules and Regulations:

A. Attendance in the class (or Lab):

Attendance in the class will be strictly observed starting from the first day of classes. Students shall be warned after 3 and 5 unexcused absences. However, after 7 unexcused or 10 total absences (excused and unexcused absences), DN grade shall be awarded. Student shall be solely responsible for his DN grade and its accompanied repercussion or negative effects. The conditions are spelt out in the table below.

	Number of unexcused absences			Total absences (excused* + unexcused)
	Warning I	**Warning II**	**DN**	**DN**
30 course lectures per semester	**3**	**5**	**7**	**10**

The following should be noted

i) Students must bring text book, notebook, calculator and pen to the class

ii) Attendance in the classes will be taken within five minutes of the beginning of the class. Any **student who arrives class within 5 minutes from the start of class will be marked as late. If the student is marked late 3 times, then this is equivalent to 1 unexcused absence. Student who arrives after 5 minutes is considered absent with no excuse.**

***Note:**

Officially authorized excuse of absences must be obtained from Deanship of Student Affairs and presented to the instructor **not later than two days** following the resumption of class attendance.

B. Waiting Time: If the instructor is late, students are expected to wait for 15 minutes and then are free to go

C. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but not limited to the following practices:

- **Cheating**, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- **Plagiarism**, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
- **Impersonation** or taking an exam in proxy.
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.

D. Penalties for Violations of Academic Integrity

Having witnessed or otherwise identified an apparent violation of the academic integrity policy, the faculty member may either impose or recommend an appropriate penalty, depending upon the seriousness of the offense.

The instructor may impose any one of the following penalties:

- a written notice of warning, with a copy placed in the student's file with the advisor;
- a reduced grade on the assignment;
- a grade of F (zero if graded numerically) for the assignment;
- a reduced grade for the course;
- a grade of F for the course.

E. Class/Lab Rules

- Use of **mobile phones** (for phone calls, texting, *Facebook, WhatsApp, Instagram* etc.) is **not allowed** during the class period.
- **Smoking, eating or drinking** is **not permitted** at any time.
- **Excuse** must be requested and granted before **leaving the class** for any reason.
- Lab dress code: boot, trousers and shirt

F. Assignments and Quizzes

- Problems or questions will be assigned regularly. Students will be required to solve these problems and submit the solutions within one week or as may be determined by the instructor.
- No assignment will be accepted after its due date.
- There will be no makeup quiz.
- Students should make every effort to meet all announced deadlines. Any constraint to meet the deadline shall be reported to the instructor for him to determine whether an extension is required or not.

G. Communication

The students shall constantly use the blackboard to communicate among themselves and with the instructor. Students are encouraged to check their e-mails daily to check whether there exists any special instruction or information from the instructor.

9. Schedule of Classes

Week	Date	Topics	Assessment methods	Proportion of Total Assessment
1	29/08/2021	Introduction and basic concepts: Power in single-phase ac circuits		
	31/08/2021	Introduction and basic concepts: Balanced three-phase circuits		
2	05/09/2021	Introduction and basic concepts: Balanced three-phase power	**Homework # 1**	**2%**
	07/09/2021	Per unit representation and equivalent circuits: The single-line or one-line diagram	**Quiz # 1**	**3%**
3	12/09/2021	Per unit representation and equivalent circuits: Impedance and reactance diagrams		
	14/09/2021	Per unit representation and equivalent circuits: Change of base (base conversions)	**Homework # 2**	**2%**
4	19/09/2021	Network calculation: The admittance model and bus admittance matrix	**Quiz # 2**	**3%**
	21/09/2021	Network calculation: Algorithm for formation of the bus impedance matrix		
5	26/09/2021	Power flow analysis: Power flow problem formulation Power flow analysis: Power flow problem solution using Gauss-Seidel method		
	28/10/2021	Power flow analysis: Power flow problem solution using Gauss-Seidel method	**Homework # 3**	**2%**
6	03/10/2021	Power flow analysis: Power flow problem solution using Newton Raphson method	**Major exam I**	**15%**
	05/10/2021	Power flow analysis: Power flow problem solution using Newton Raphson method		
7	10/10/2021	Power flow analysis: Power flow problem solution using fast decoupled method	**Quiz # 3**	**3%**
	12/10/2021	Introduction PowerWolrd		

8	17/10/2021	Symmetrical components: Fundamentals		
	19/10/2021	Sequence networks: Sequence networks of power systems components		
9	24/10/2021	Sequence networks: Sequence networks of power systems components	**Homework # 4**	**2%**
	26/10/2021	Symmetrical faults analysis	**Quiz # 4**	**3%**
10	31/10/2021	Symmetrical faults analysis		
	02/11/2021	Unsymmetrical faults analysis: Single line-to-ground fault		
11	07/11/2021	Unsymmetrical faults analysis: line-to-line fault	**Major exam II**	**20%**
	09/11/2021	Unsymmetrical faults analysis: Double line-to-ground fault		
12	14/11/2021	Unsymmetrical faults analysis		
	16/11/2021	Unsymmetrical faults analysis using PowerWolrd		
13	21/12/2021	Transient stability: Swing equation		
	23/12/2021	Transient stability: Synchronous machine models for stability studies		
14	05/12/2021	Transient stability: Transient stability-equal-area criterion	**Design project**	**10%**
	07/12/2021	Transient stability: Application to sudden increase in power input		
15	12/12/2021	Transient stability: Application to three-phase fault	**Homework # 5**	**2%**
	14/12/2021	Transient stability: Critical Clearing Time	**Quiz # 5**	**3%**
16	19/12/2021	Transient stability using PowerWolrd		
	21/12/2021	Transient stability using PowerWolrd		
17-18		**Final Exam**		**30%**

10. Schedule of Exams for CE 335

Examination	**Major I**	**Major II**	**Final Exam**
Week No.	6	11	17-18
Date	Sunday 03/10/2021	Sunday 07/11/2021	See final exam schedule

Note:

i. Make-up exam will be given only in case the affected student has an approved medical excuse
ii. Any potential conflicts with other exams must be reported **in advance** for adequate adjustment.

11. Assessment Plan for the Course

Assessment Policy	Weighting:	Letter Grading Scale:
Homework	10%	0% < 60% F 60 % < 65% D 65% < 70% D+ 70% < 75% C 75% < 80% C+ 80% < 85% B 85% < 90% B+ 90% < 95% A 95% to 100% A+
Quizzes	15%	
Major exam 1	15%	
Major exam 2	20%	
Term project	10%	
Final exam	30%	
Total	**100**	

12. ABET Category Contents

Engineering Science	30%	(0.9 credit hours)
Engineering Design	70%	(2.1 credit hours)

Prepared/Modified by: **Signature:** **Date:** 29-08-2021

Prof. Dr. Houssem Bouchekara