ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING & SCIENCE
ELECTRIC AND COMPUTER ENGINEERING PROGRAM
COURSE DESCRIPTION AND SYLLABUS

Course Title	Code	Semester	T+L Hours	Credit	ECTS
Advanced Power System Analysis	ECE-652	FALL-SPRING	3 + 0	3	10

Prerequisite Courses	None

Type	Selective
Language	English
Coordinator	Assist. Prof Dr. Ahmet Onen
Instructor	Assist. Prof Dr. Ahmet Onen
Adjunt	none
Aim	Power system modelling, power flow calculatio and short circuit studies and usage of a programming language during the course of these analysis.
Learning Outcomes	• learn the principles of power systems • learn the three phase system and their connection types • learn the how convert system in per-unit system and model power system based on per-unit system • learn how to contruct admittance matrix and impedance matrix • learn how to calculate power flow for each busses and components by using different iterative techniques • learn how to calculate the short circuits for different cases and model power system based on the type of the faults • learn economy of power system with and without exinsting of losses.
Course Content	• Power system overview, • There phase system and connection (delta-y), • Power systems in per-unit system, • Admittance matrix modeling and usages, • Derivation of network reduction, • Derivation of Z bus modification, • Power Flow Calculation by using gauss-seidel and newton Raphson methods , • Symetrical and unsymetrical components • Short circuit calculation, • Economic operation of power systems

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Power system overview: Review of basic power equations	
2	There phase system and connection (delta-y): Delta and Y connections, their equations, usage and transition from one to another	
3	Power systems in per-unit system: Conversion of actual values into per unit values to solve equations	
4	Admittance matrix modeling: How to construct admittance matrix by using power system and usages	
5	derivation of network reduction: reduction of network by using reduction method to simplfy network	
6	Derivation of Z bus modification: How to contruct Z matrix and its usage in power systems	
7	MIDTERM EXAM-1	
8	Power Flow Calculation by using gauss-seidel method: Calculation of power flow for each busses by using Gauss Seidel iteration method	
9	Power Flow Calculation by using newton Raphson method: Calculation of power flow for each busses by using Newton Raphson iteration method	
10	Symetrical and unsymetrical components: learning how to calculate symetrical and unsymetrical components	
11	Short circuit calculation: calculation of short circuits for symetrical and unsytmetrical component	
12	presentation of review	

13	Short circuit calculation 2: calculation of power system breaker sizes	
14	Economic operation of power systems without losses: calculation of power system economy without losses	
15	Economic operation of power systems with losses: calculation of power system economy with the losses.	
16	Final Exam	

SOURCES	
Lecture Notes	Lecture slides
Other Sources	TEXTBOOK: 1. Power system analysis, John Grainger and William Stevenson. RECOMMENDED BOOKS: Power System Analysis and Design, Fifth Edition, J. Duncan Glover, Mulukutla S. Sarma, Thomas Overbye.

COURSE MATERIALS SHARING	
Documents	Lecture notes, slides
Homeworks	Students will be given one homework each week
Exams	1 Midterm and 1 Final Exam

EVALUATION SYSTEM		
SEMESTER STUDY	**NUMBER**	**CONTRIBUTION**
Midterm	1	20
Homework	14	25
Quiz	14	25
SUB-TOTAL		70
Contribution of Semester Study		70
Contribution of Final Exam	1	30
TOTAL		100

Course Category	
Sciences and Mathematics	30%
Engineering	70%
Social Sciences	0%

RELATIONSHIPS BETWEEN LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS

No	Program Qualifications	Contribution Level				
		1	2	3	4	5
1	The skills of using mathematics, science and engineering information in advanced research,					**X**
2	The skills of analyzing, designing and/or implementing an original system that will be able to solve an engineering problem,					**X**
3	The skills of using the required software, hardware and modern measurement equipments in their field of research,					**X**
4	The skills of planning independent research and implementing in detail,					**X**
5	The skills of following literature, listening to and making technical presentation, writing a paper in academic level,				**X**	
6	The skills of innovative and interrogative thinking and finding original solutions				**X**	

*Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Number	Duration	Total Work

		(Hours)	Load
Course Length (includes exam weeks: 16x total course hours)	16	3	48
Out-of-class Study Time (Pre-study, practice)	16	5	90
Internet search, library work, literature search	16	4	64
Presentation	7	3	21
Homework	16	4	64
Midterm	1	15	15
Final Exam	1	20	20
Total Work Load			322
Total Work Load / 30			322/30
Course ECTS Credit			10