

#### **COURSE RECORD**

Code	<b>ECE653</b>
Name	<b>Power System Operations and Controls</b>
Hour per week	3 (3 + 0)
Credit	3
ECTS	7,5
Level/Year	Graduate
Semester	Fall-Spring
Type	Elective
Location	In Class
Prerequisites	ECE 652
Special Conditions	
Coordinator(s)	Doç. Dr. Ahmet Onen
Webpage	
Content	<ul style="list-style-type: none"> <li>• Power generation characteristic and its importance,</li> <li>• Economic dispatch of thermal units and calculations,</li> <li>• Design transmission system and loss calculation,</li> <li>• Restructure of electric system and how to calculate energy prices</li> <li>• Automatic Generation Control and applications,</li> <li>• Load Forecasting,</li> <li>• State Estimation and Bad Data Analysis,</li> <li>• Optimum load flow,</li> <li>• Online load flow,</li> </ul>
Objectives	Power system control application, optimum power flow calculation and economic dispatch and usage of a programming language during the course of these analysis.
Learning Outcomes	LO-1. learn the principles of control system in power systems LO-2. learn the power generation characteristic LO-3. learn the how to economic dispatch of thermal units LO-4. learn how to design transmission system and loss calculation LO-5. learn restructure of electric system and how to calculate energy prices (LMP) LO-6. learn how to apply control in power system LO-7. learn how to forecast load for future years and state estimation LO-8. Computer Application for Power systems
Requirements	Expected requirements of the course.
Reading List	Recommended readings, text books, etc.
Ethical Rules and Course Policy	Will be announced during the class.

#### **LEARNING ACTIVITIES**

<b>Activities</b>	<b>Number</b>	<b>Weight (%)</b>
Lecture	3	25%
Group Works	8	25%
Presentations	7	25%
Site Visits	1	25%
	Total	100

#### **ASSESSMENT**

<b>Evaluation Criteria</b>	<b>Weight (%)</b>
Quizzes	15%
Weekly Assignments	20%
Group Project Assignments & Presentations	10%

Attendance/Participation	05%
Final Exam/Submission	50%
Total	100%

For a detailed description of grading policy and scale, please refer to the website <https://goo.gl/HbPM2y> section 28.

**COURSE LOAD** *Please, use this one as a reference for your course*

Activity	Duration (hour)	Quantity	Work Load (hour)
In class activities	2	14	28
Lab	1	7	7
Group work	2	12	24
Research (web, library)	2	12	24
Required Readings	2	10	20
Pre-work for Presentation	2	7	14
Lab reports	1	7	7
<b>General Sum</b>			<b>124</b>

**ECTS: 7,5** (Work Load/25-30)

**CONTRIBUTION TO PROGRAMME OUTCOMES\***

	P01	P02	P03	P04	P05	P06
L01	1	3	4	5	4	3
L02	5	5	4	5	4	3
L03	3	4	2	2	4	1
L04	1	3	4	5	4	3
L05	5	5	4	5	4	3
L06	3	4	2	2	4	1
L07	5	5	4	5	4	3
L08	3	4	2	2	4	1

\* Contribution Level: 0: None, 1: Very Low, 2: Low, 3: Medium, 4: High, 5: Very High

**WEEKLY SCHEDULE**

W	Topic	Outcomes
1	Power system overview: Review of basic power equations Power generation characteristic Steam generation units, and gas turbine	L01, L02
2	Economic dispatch of thermal units: Economic calculation and lamda iteration method Economic dispatch of thermal units first and second order gradient method and economic calculations	L01, L02, L03
3	Tranmission Losses: Load flow calculation on transmission lines Tranmission Losses: Loss calculation by using B matrix and penalty factor	L01, L03
4	MIDTERM EXAM-1 Restructure of electric system: ISO, RTO and power exchange	
5	Restructure of electric system: LMP calculation and Fixed transmission Right Power system overview: Review of basic power equations	L01, L02, L03
6	Power generation characteristic Steam generation units, and gas turbine Economic dispatch of thermal units: Economic calculation and lamda iteration method	L04, L05
7	Economic dispatch of thermal units first and second order gradient method and economic calculations	L05, L06

	Tranmission Losses: Load flow calculation on transmission lines	
8	Tranmission Losses: Loss calculation by using B matrix and penalty factor MIDTERM EXAM-1	L04, L05
9	Restructure of electric system: ISO, RTO and power exchange Restructure of electric system: LMP calculation and Fixed transmission Right	L06, L07
10	Unit Commintment: calculation of optimum order for thermal units Load Forecasting: Load Calculation for different weather condition	L07, L08
11	MIDTERM EXAM-2 or presentation of review Optimum Load Flow: Optimum load flow calculation with existing of constraints	
12	State Estimation and Bad Data Analysis: Voltage and phase angle calculation when measurements are not avaiable	L04, L05
13	Automatic Generation Control: Generator model, tie-line and load model and control of all. Unit Commintment: calculation of optimum order for thermal units	L01, L02
14	Load Forecasting: Load Calculation for different weather condition MIDTERM EXAM-2 or presentation of review	L01, L02
15	Optimum Load Flow: Optimum load flow calculation with existing of constraints State Estimation and Bad Data Analysis: Voltage and phase angle calculation when measurements are not avaiable	L01, L02

Prepared by  
Doç. Dr. Ahmet ONEN  
Date  
09.04.2018