Course Specification

(Postgraduate Programs)

Course Title:	Power System Operation and Control
Course Code:	2202-513
Program:	Master in Electrical Engineering
Department:	Electrical Engineering
College:	College of Engineering
Institution:	King Faisal University
Version:	V2
Last Revision Date:	17 April 2025

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	☐ University	☐ College	☒ Department	☐ Track
B.	☐ Required		☒ Elective	
3. Level/year at which this course is offered: Level 2/1st year				
4. Course General Description:				
Provide advanced topics in power system stability, control and optimal operation; Economic dispatch of thermal units and methods of solution; unit commitment. Transmission line transients. Control of generation. Active power-frequency control and reactive power-voltage control. Automatic generation control. Optimal power flow. Principles of power system automatic control and power network security.				
5. Pre-requirements for this course (if any)**:**				
None, but students must have taken Power Systems during their Bs.				
6. Co-requirements for this course (if any)**:**				
None				
7. Course Main Objective(s):				
1. Advance topics in stability control **2.** Principle of generation control **3.** Economic dispatch of thermal plants and unit commitment **4.** Optimal power flow and reactive power-voltage control **5.** Automatic Generation Control and active power-frequency control **6.** Principles of power system automatic control and power network security.				

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid ● Traditional classroom ● E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lecture**	45
2.	**Laboratory/Studio**	6
3.	**Seminars**	3
4.	**Others** (specify) Introduction to Simulation Software	
	Total	54 Hours

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Identify and formulate engineering problems for operation of power systems	K1	Lectures	Case studies Assignments Exams
1.2	Understand the control methods of power generation in power plants	K1	Lectures	Case studies Assignments Exams
1.3	Acquire detailed engineering aspects of Economic Dispatch	K1	Lectures	Case studies Assignments Exams
1.4	Realize applied stability control methods in dynamics of power generation	K1	Lectures	Case studies Assignments Exams
2.0	**Skills**			
2.1	Simulate different scenarios of unit commitment and dispatches	S2	Demo of simulation package	-Simulation reports submission -Result discussion
2.2	Design frequency control schemes for a	S1, S2	Case studies	-Simulation reports submission

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	practical generating plant			-Result discussion
2.3	Prepare report related to research project and make oral presentation	S1	Research project	-Report submission -Presentation
3.0	**Values, autonomy, and responsibility**			
3.1	Prepare report related to research project and make oral presentation	V1, V2	Research project	-Report submission -Presentation

C. Course Content:

No	List of Topics	Contact Hours
1.	Advanced topics in power system stability	6
2.	Principle of Generation Control	9
3.	Economic Dispatch of thermal plants and unit Commitment	10
4.	Optimal power flow and reactive power voltage control	4
5.	Automatic Generation Control and active Frequency control	10
6.	Principles of Power system security.	6
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	3 Case studies assignments	Week 5, 8, 12	15%
2.	Midterm	9	25%
3.	Research project	14	25%
4.	Final exam	15	35%
	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Allen J. Wood, Bruce Wollenberg, “Power Generation Operation & Control”, 3rd edition, Wiley Limited, 2013, pgs. 588, ISBN: 9780471790556

Supportive References	Hadi Saadat, "Power System Analysis", McGraw-Hill Publisher, 2010, pgs. 697, ISBN: 9780075616344.
Electronic Materials	Instructor Handouts
Other Learning Materials	Engineering case studies

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom: 30 seats
Technology equipment (Projector, smart board, software)	Data show Matlab Software Power World ® software
Other equipment (Depending on the nature of the specialty)	Computer Lab

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect- Online Survey
Effectiveness of students' assessment	Students and Faculty	Direct and Indirect Assessment
Quality of learning resources	Students and Faculty	Indirect- Online Survey
The extent to which CLOs have been achieved	Students and Faculty	Direct and Indirect Assessment
Other	None	None

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**EE DEPARTMENT QUALITY COMMITTEE**
REFERENCE NO.	**MEETING # 10**
DATE	**APRIL 19, 2025**