INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

POWER SYSTEM OPERATION AND CONTROL								
VII Semester: EEE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AEEC35	**Core**	3	-	-	3	30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: DC Machines and Transformers, Power System Analysis								

I. COURSE OVERVIEW:
This course enables students to analyze various parameters which effects the operation and control of power system. The course deals with control strategies to generate and distribute power in an interconnected system economically and reliably, maintenanceof the frequency and voltage within permissible limits, the factors influencing power generation at minimal cost are operating efficiencies, fuel cost and transmission losses, steady state flow of active and reactive power, development of optimal dispatch solutions to find the optimal dispatch of generation for an interconnected power system.

II. COURSE OBJECTIVES:
Students will try to learn:

I. The economic operation of power systems, hydro thermal scheduling.
II. The modeling of turbines, generators and automatic controllers.
III. The single area and two area load frequency control.
IV. Analyze reactive power control and load modeling.

III.COURSE SYLLABUS:
MODULE-I: ECONOMIC OPERATION OF POWER SYSTEMS (12)
Optimal scheduling of thermal power system: Optimal operation of generators in thermal power stations, heat rate curve, cost curve, incremental fuel and production costs, input output characteristics, optimum generation allocation without and with transmission line losses coefficients, general transmission line loss formula, unit commitment; Optimal scheduling of hydrothermal system: Hydroelectric power plant models, scheduling problems, short term hydro thermal scheduling problem.

MODULE-II: MODELING OF GOVERNOR, TURBINE AND EXCITATION SYSTEMS (09)
Modeling of governor: Mathematical modeling of speed governing system, derivation of small signal transfer function; Modeling of turbine: First order turbine model, block diagram representation of steam turbines and approximate linear models; Modeling of excitation system: Fundamental characteristics of an excitation system, transfer function, block diagram representation of IEEE type-1 model.

MODULE-III: SINGLE AREA AND TWO AREA LOAD FREQUENCY CONTROL (09)
Load frequency control of single area system: Necessity of keeping frequency constant, definitions of control area, single area control, block diagram representation of an isolated power system, steady state analysis, dynamic response, uncontrolled case.

Load frequency control of two area system: Uncontrolled case and controlled case, tie line bias control; Load frequency controllers: Proportional plus integral control of single area and its block diagram representation, steady state response, load frequency control and economic dispatch.

MODULE-IV: COMPENSATION FOR POWER FACTOR IMPROVEMENT AND REACTIVE POWER CONTROL (09)
Voltage control: Equipment for voltage control, effect of series capacitors, line drop compensation, effect of AVR,

power factor control using different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (fixed and switched), power factor correction, capacitor allocation, economic justification, procedure to determine the best capacitor location; Reactive power control: Reactive power compensation in transmission systems, advantages and disadvantages of different types of compensating equipment for transmission systems; Uncompensated and compensated transmission lines: Shunt and series compensation.

MODULE-V: LOAD COMPENSATION (06)

Load Compensation: characteristics of loads, factors associated with loads, relation between the load factor and loss factor; specifications of load compensator; Classification of loads: Residential, commercial, agricultural and industrial loads and characteristics.

IV. TEXT BOOKS:

1. C L Wadhwa, "Electrical power systems", New age International, 3rd Edition, 2005.
2. I J Nagarath, D P Kothari, "Modern power system analysis", Tata McGraw-Hill, 2nd Edition, 2006.

V. REFERENCE BOOKS:

1. Singh S N, "Electric Power Generation, Transmission and Distribution", Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition, 2002.
2. T J E Miller, "Reactive power control in Electrical system", Wiley Interscience Publication, 1982.
3. V K Mehta and Rohit Mehta, "Principles of Power System", S Chand, 3rd revised Edition, 2015.
4. Turan Gonen, "Electrical Power Distribution System Engineering", CRC Press, 3rd Edition, 2014.
5. V Kamaraju, "Electrical Power Distribution Systems", TMH, Publication, Edition, 2009
6. O I Elgerd, "Electrical Energy Systems Theory", Tata McGraw-Hill, 2nd Edition, 2007.

VI. WEB REFERENCES:

1. https://www.electrical4u.com/working-or-operating-principle-of-dc-motor
2. https://www.freevideolectures.com
3. https://www.ustudy.in › ElectricalMachines
4. https://www.freeengineeringbooks.com

VII. E-TEXT BOOKS:

1. https://www.textbooksonline.tn.nic.in
2. https://www.freeengineeringbooks.com
3. https://www.eleccompengineering.files.wordpress.com
4. https://www.books.google.co.in