SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
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Recognized by UGC Under Sections 2(f) & 12 (B) of UGC Act 1956
Approved by AICTE, New Delhi, Permanent Affiliated to JNTU K, Kakinada
Seetharampuram, NARSAPUR-534 280, W.G-Dist., Andhra Pradesh

Department of Electrical and Electronics Engineering

TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods/ Week	Academic Year	Date of Commencement of Semester
16EE7T01	POWER SYSTEM OPERATION AND CONTROL	VII	EEE	6	2021-2022	04-10-2021

Course Outcomes: *After successful completion of this course, students should be able to:*

1	Compute the optimal generation schedule of all thermal power and hydrothermal system.(K3)
2	Apply different solution methods like priority-list and dynamic-programming solution methods for unit commitment problem.(K3)
3	Differentiate between different generations control like supplementary control action, tie-line control and automatic generation control.(K2)
4	Demonstrate different types of reactive power compensation techniques in Power Systems.(K2)

Unit	Outcome/Bloom's Level	Topics No.	Topics/ Activity	Text Book/ Reference	Contact Hour	Delivery Method
I	COURSEOUTCOME-1: Compute the optimal generation schedule of all thermal power and hydrothermal system. **(K3)**	**UNIT-1. Economic Operation of Power Systems**				
		1.1	Optimal operation of generators in thermal power stations-an introduction	T1,R2	1	Chalk&Talk, PPT
		1.2	System Constraints-Equality and inequality	T1,R2	1	Chalk&Talk, PPT
		1.3	Input-output characteristics, Heat curve, Cost curve and Increment fuel and production costs	T1,R2	1	Chalk&Talk, PPT
		1.4	Optimum generation allocation with line loss neglected	T1,R2	1	Chalk&Talk, PPT
		1.5	Problem formulation-objective function-constraints-solution procedure -Algorithm	T1,R2	1	Chalk&Talk, PPT
		1.6	Problem with different case studies	T1,R2	1	Chalk&Talk, PPT
		1.7	Optimum generation allocation including the effect of line loss	T1,R2	1	Chalk&Talk, PPT
		1.8	Problem formulation-objective function-constraints- loss equation-solution procedure	T1,R2	1	Chalk&Talk, PPT
		1.9	Problem with case studies	T1,R2	1	Chalk&Talk, PPT

		1.10	Loss coefficients-derivation of B_{mn} coefficient in terms of system parameters	T1,R2	1	Chalk&Talk, PPT
		1.11	General transmission line loss formula- derivation of loss formula in terms of bus powers and system parameters	T1,R2	1	Chalk&Talk, PPT
	Content beyond the syllabus (if need)	Optimization of power system by Lambda iteration, penalty factor methods and evolutionary algorithm: Classical comparison				
				Total	12	
		UNIT-2. Hydrothermal Scheduling				
II	COURSEOUTCOME-1: Compute the optimal generation schedule of all thermal power and hydrothermal system. **(K3)**	2.1	Hydrothermal scheduling (HTS): An introduction	R1,R2	1	Chalk&Talk, PPT
		2.2	Hydroelectric power plant models-classification	R1,R2	1	Chalk&Talk, PPT
		2.3	Input-output characteristics- Incremental Water Rate Characteristics- Incremental Production Cost Characteristic	R1,R2	1	Chalk&Talk, PPT
		2.4	Optimal scheduling of hydrothermal system	R1,R2	1	Chalk&Talk, PPT
		2.5	Problem formulation-objective function-constraints	R1,R2	1	Chalk&Talk, PPT
		2.6	Solution procedure - Algorithm	R1,R2	1	Chalk&Talk, PPT
		2.7	Scheduling problems - Types of HTS problem	R1,R2	1	Chalk&Talk, PPT
		2.8	Short term hydrothermal scheduling problem	R1,R2	1	Chalk&Talk, PPT
		2.9	Problem formulation-objective function-constraints- Without line loss	R1,R2	1	Chalk&Talk, PPT
		2.10	Problem formulation-objective function-constraints- With line loss	R1,R2	1	Chalk&Talk, PPT
		2.11	Problem with different case studies	R1,R2	1	Chalk&Talk, PPT
	Content beyond the syllabus (if need)	Optimum operation of Fixed/Cascaded hydrothermal power system using ABC algorithm				
				Total	12	
III	COURSEOUTCOME-	**UNIT-3. Unit Commitment**				
		3.1	Optimal Unit Commitment problem: An overview	T1,R2	1	Chalk&Talk, PPT

	2: Apply different solution methods like priority-list and dynamic-programming solution methods for unit commitment problem. (K3)	3.2	Need for unit Commitment	T1,R2	1	Chalk&Talk, PPT
		3.3	Constraints in unit commitment	T1,R2	1	Chalk&Talk, PPT
		3.4	Spinning reserve - Thermal unit constraints	T1,R2	1	Chalk&Talk, PPT
		3.5	Hydro constraints- Must run- Fuel Constraints	T1,R2	1	Chalk&Talk, PPT
		3.6	Cost function formulation- Start-upcost consideration	T1,R2	1	Chalk&Talk, PPT
		3.7	Shut-down cost consideration	T1,R2	1	Chalk&Talk, PPT
		3.8	Solution methods- Priority ordering	T1,R2	1	Chalk&Talk, PPT
		3.9	Dynamic programming	T1,R2	1	Chalk&Talk, PPT
		3.10	Problem with different case studies	T1,R2	1	Chalk&Talk, PPT
		3.11	Problem with different case studies continued	T1,R2	1	Chalk&Talk, PPT
				Total	11	
IV	**COURSEOUTCOME-3:** Differentiate between different generations control like supplementary control action, tie-line control and automatic generation control. (K2)	**UNIT-4. Single Area Load Frequency Control**				
		4.1	Modeling of steam turbine- Common types	T2, R1	1	Chalk&Talk, PPT
		4.2	Mathematical modeling	T2, R1	1	Chalk&Talk, PPT
		4.3	Torque developed- transfer function- block diagram representation	T2, R1	1	Chalk&Talk, PPT
		4.4	Modeling of generator- Mathematical modeling	T2, R2	1	Chalk&Talk, PPT
		4.5	Transfer function block-diagram representation	T2, R2	1	Chalk&Talk, PPT
		4.6	MM of speed governing system - Construction and working principle	T2, R2	1	Chalk&Talk, PPT
		4.7	Block diagram representation	T2, R2	1	Chalk&Talk, PPT
		4.8	Modeling of hydro turbine - Transfer function- block diagram representation	T2, R2	1	Chalk&Talk, PPT
		4.9	Necessity of keeping frequency constant	T2, R1	1	Chalk&Talk, PPT
		4.10	Control area - Definitions	T2, R1	1	Chalk&Talk, PPT
		4.11	Single area control - Block diagram representation of an isolated power system	T2, R1	1	Chalk&Talk, PPT
		4.12	Steady state analysis - Uncontrolled case -	T2, R1	1	Chalk&Talk, PPT

6.6	compensated transmission lines - Shunt compensation	T1. R3	1	Chalk&Talk, PPT
6.7	Series compensation	T1. R3	1	Chalk&Talk, PPT
6.8	Introduction to FACTS	T1. R3	1	Chalk&Talk, PPT
6.9	Problem Solving	T1. R3	1	Chalk&Talk, PPT
		Total	09	
		Cumulative Proposed Periods	69	

Text Books:

S. No.	Authors, Book Title, Edition, Publisher, Year of Publication
1.	C.L.Wadhwa, Electrical power systems -New Age International (P) Limited, Publishers, 7th Edition, 2016.
2.	I.J.Nagrath & D.P.Kothari, Modern Power System Analysis, Tata Mc Graw Hill Publishing Company Ltd. 4nd edition, 2011.

Reference Books:

S. No	Authors, Book Title, Edition, Publisher, Year of Publication
1.	Jizhong Zhu, Optimization of Power System Operation. IEEE Press Series on Power Engineering, Wiley-IEEE Press. 2 edition, 2016.
2.	D. Vijay Kumar, Power System operation and control, Scitech publications India Pvt.Ltd. 4th Reprint, 2018.
3.	Abhijit Chakrabarti, kothari D. P., Mukhopadhyay A. K., de Abhinandan, An Introduction to Reactive Power Control and Voltage Stability in Power Transmission Systems. by PHI Learning Pvt. Ltd., 2010.
4.	D.P. Kothari and J.S. Dhillon, Power system optimization, PHI Learning Pvt. Ltd., 2nd Edition, 2010.

Web Details:

1.	https://electrical4u.in/electrical_powersystems
2.	https://en.wikipedia.org/wiki/power_systems
3.	https://nptel.ac.in/courses/108/101/1081010-10
4.	https://www.google.co.in/books/edition/Electrical_Power_Systems/uXQWEAAAQBAJ?hl=en&gb pv=0

		Name	Signature with Date
i.	Course Coordinator-i	Mr.A.Satyanarayana	
ii.	Course Coordinator-ii	Mr. A.VD Suresh Kumar	
iii.	Module Coordinator	Mr. V. Madhu	
iv.	Programme Coordinator	Mr.A.Satyanarayana	

Principal