NIRMA UNIVERSITY

Institute:	**Institute of Technology**
Name of Programme:	**B.Tech. in Electrical Engineering**
Semester:	**VII**
Course Code:	**2EEDE12**
Course Title:	**Power System Optimization**
Course Type:	(□ Core/ □ Value Added Course / √ **Department Elective**/ □ Institute Elective/ □ University Elective/ □ Open Elective/ □ Any other)
Year of Introduction:	**2021 – 22**

Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to-

1. analyse the power system problems requiring optimal solution
2. formulate mathematical model(s) for power system problems
3. implement classical optimization techniques to solve power system problems
4. apply soft computing techniques to solve power system optimization problems

Syllabus: **Total Teaching hours: 45**

Unit	Syllabus	Teaching hours
Unit-I	**Introduction** Need of optimization in power system, general mathematical formulation of optimization problem, classification of optimization methods.	**02**
Unit-II	**Economic Load Dispatch** Mathematical formulation of Economic Load Dispatch (ELD), economic load dispatch without and with losses, application of classical optimization methods for economic load dispatch (e.g. gradient method, Newton's method), application of soft computing method for economic load dispatch (e.g. Genetic Algorithm, Particle Swarm Optimization).	**10**
Unit-III	**Optimal Power Flow** Optimal power flow (OPF) Vs economic load dispatch, DC Vs AC optimal power flow, constraints in optimal power flow, mathematical formulation of optimal power flow with different objective function, classical optimization method for optimal power flow (e.g. Interior -point method), application of soft computing method for optimal power flow (e.g. Genetic Algorithm, Particle Swarm Optimization).	**11**
Unit-IV	**Unit Commitment** Unit commitment Vs economic load dispatch, constraints in unit commitment -spinning reserve, thermal unit constraints, hydro constraints, must run and fuel constraints, classical optimization method for unit commitment (e.g. Dynamic Programming, Lagrange	**12**

	Relaxation method), application of soft computing method for unit commitment (e.g. Genetic Algorithm, Particle Swarm Optimization).	
Unit-V	**Hydrothermal Coordination** Long-range Vs short-range hydro-scheduling, scheduling problem formulation, hydro units in series, pumped storage hydroplants, application of classical optimization for hydrothermal scheduling (e.g. Dynamic Programming), application of soft computing method for hydrothermal scheduling (e.g. Genetic Algorithm, Particle Swarm Optimization).	**10**

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

1. Allen J. Wood and Bruce F. Wollenberg, Power Generation Operation and Control, John Willey & Sons, New York.
2. Jizhong Zhu, Optimization of Power System Operation, IEEE Press Series on Power Engineering, Wiley-IEEE Press.
3. D. P. Kothari, J. S. Dhillon, Power System Optimization, PHI Press.
4. S. S. Rao, Engineering Optimization Theory and Practice, John Wiley & Sons
5. K. Y. Lee and M.A. El-Sharkawi (eds.), Modern Heuristic Optimization Techniques with Applications to Power Systems, IEEE Press
6. S.N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley India Pvt. Ltd.
7. Chaturvedi Devendra K., Soft Computing Techniques and Applications in Electrical Engineering, Springer-Verlag Berlin Heidelberg
8. Relevant recent literature, journal articles

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2021-22 and onwards