Advanced Power System

Subject Code – EEE301 **L:T:P-**

1. RATIONALE

A power system comprises the various subsystems including generation, transmission, distribution and Load dispatch. Basic knowledge of Electrical Power Systems is essential for students of a diploma in Electrical Engineering to work in the Generation, transmission, and distribution field. This is to ensure the safe and reliable operation of electrical systems, optimize performance, and plan for future growth. It achieves this by verifying the system is properly protected, minimizing power losses and costs, and ensuring equipment is correctly sized and specified

2. COURSE SKILL SET

The course aims to help the student to attain the following industry-identified competency through various teaching –learning experiences

- Fault calculations determine the magnitude of current during abnormal conditions like short circuits in a power system.
- Power system stability.

3. COURSE OUTCOMES

On successful completion of the course, the students will be able to:

CO-01	Describe the basics of electrical power.
CO-02	Describe and analyze the load flow studies.
CO-03	Describe the fault categorizations and calculations
CO-04	Describe the concept of stability and factors affecting it.

4. DETAILS OF COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

Session No.	**Lecture (Knowledge Criteria)**	**L**	**T**	**Practice (Performance Criteria)**
Unit-1	**Basic concepts**	**6**	**2**	Determination of transient and sub-transient reactance of a 3-phase alternator
1	Introduction			
2	Single Sub-script Notation			
3	Double Subscript Notation			
4	Power In Single Phase AC Circuit			
5	Complex Power			
6	The Power Triangle			
7	Direction of Power Flow			
8	Voltage and Current in Balanced Three-phase Circuits			
9	Power in Balanced Three-Phase Circuit			
10	Per-Unit Quantities			
11	Changing the Base of Per-unit Quantities			

Unit-2	**Load Flow Studies**			
12	Load Flow and Its Importance	**11**	**4**	Perform load flow, optimal power flow and economic dispatch in power systems.
13	Classification of Buses			
14	Load Flow Techniques			
14	The Power-Flow Problem			
15	The Gauss-Seidel Method			
16	The Newton-Raphson Method			
17	The Newton-Raphson Power- Flow Solution			
Unit-3	**Fault Calculation**	**8**		Fault analysis and determination of transient stability of power systems.
18	Nature of Faults in Electrical System		**2**	
19	Fault Calculation(Numerical)			
20	Symmetric and Asymmetric Faults			
21	Method of Sequence components-sequence network			
Unit-4	**Power System Stability**	**11**	**3**	Experiment on Power System dynamics
22	Definition and Illustration of Terms: Power System Stability and Instability			
23	Stability limit , Steady-State Stability and Its Limit Dynamic State Stability,simple numericals			
24	Adverse Effects of Instability			
25	Swing Equation and the Significance of Power Angle			
26	Transient Stability Factor Affecting Transient Stability, Methods of Improving Transient Stability,Derivation of Maximum Power Flow Under Steady State.			
UNIT 5	**Smart Grid & Microgrid**			
27	Introduction to smart grid,Architecture & technologies of smart grid system	**3**	**2**	Determine power quality measures of an AC-DC microgrid
28	Introduction to micro-grids – Types of micro-grids – autonomous and non-autonomous grids – Micro-grids with multiple DGs			
Total in hours		39	13	52

References:

1.Electrical Power Systems by **C. L. Wadhwa,Publisher. New Age International Pvt Ltd Publishers**

2.Power System Stability And Control by Prabha kundur,publisher, McGraw-Hill

3.Microgrids: Design, Applications and Control by **Randy Allen, Edward Jacobs publisher Nova**