



**Course Title: Substation Engineering**

**Credit Units: 4**

**Course Level: UG**

**Course Code: ELEC402**

L	T	P/S	SW/F W	TOTAL CREDIT UNITS
3	1	-	-	4

**Course Objectives:**

To understand various substation basics, switching configurations, Understand different types of bus bar configurations, power factor correction devices, SCADA system and its application in Power System, substation automation and gas insulated substations.

**Pre-requisites:**

Power system-I, Power System-II, Power System Protection

**Course Contents/Syllabus:**

	Weightage (%)
<b>Module I</b>	
Introduction Functions of a substation, Classification, Layout, Design and Construction of Bus Bar and earth wire in substation. Jumpering, Factors affecting layout of substation, Testing of substation. Reactive power management, Fundamentals of earthing.	20
<b>Module II</b>	
Load Management, Causes and effect of low power factor; advantages of power factor improvement; PF improvement using shunt capacitors and synchronous condensers; calculation of most economic pf when (a) kw demand is constant (b) KVA demand is constant. importance of capacitor banks.	30
<b>Module III</b>	
Computer applications, SCADA subsystem, Data acquisition and data processing, supervisory control , voltage control and voltage stability, Protection using circuit breakers, fuse and protection against overvoltage. Bus bar protection.	20
<b>Module IV</b>	
Technical standards for construction of sub stations, Substation automation system. Gas insulated substations.	15
<b>Module V</b>	
Air and water pollution by thermal power plants and its control; acid rains; thermal pollution by thermal and nuclear power plants; radio-active pollution of environment by nuclear power plants; noise pollution and noise control; methods suggested to reduce the pollution. pollution flashover mechanism in insulators, basics of current transformers and voltage transformers. Economic operation of power system.	15

**Student Learning Outcomes:**

After studying this course students will be able to

1. Make a layout diagram of substation
2. Understand the causes and effect of low power factor and how it can be corrected using various compensating devices.
3. Understand the concept of SCADA in Power System.
4. Understand the cause of pollution in power plant and methods to reduce them.

**Pedagogy for Course Delivery:**

Class Room Lectures, assignments, Quizes

**Assessment/ Examination Scheme:**

<b>Theory L/T (%)</b>	<b>Lab/Practical/Studio (%)</b>	<b>Total</b>
<b>100</b>	<b>-</b>	<b>100</b>

**Theory Assessment (L&T):**

<b>Continuous Assessment/Internal Assessment</b>					<b>End Term Examination</b>
<b>Components (Drop down)</b>	<b>A</b>	<b>CT</b>	<b>S/V/Q</b>	<b>HA</b>	<b>EE</b>
<b>Weightage (%)</b>	5	10	8	7	70

**Text Reading:**

- Substation Engineering by Er. R.S. Dahiya (KATSON BOOKS)
- EHV AC and DC by S.Rao

**References:**

- Substation Automation by Richard.C Dorff.