RK.UNIVERSITY

SYLLABUS

Course Title	**Power System - II**
Course Code	EL423
Course Credit	Lecture : 03
	Practical : 00
	Tutorial : 01
	Total : 04

Course learning outcomes

At the end of semester students will be able to:

- **Describe** the impact of Skin effect, Proximity effect, and Ferranti effecton electrical parameters of transmission lines.
- **Evaluate** the necessity of reactive power compensation with the help of circle diagram.
- **Describe** corona effect on transmission line and its influence on the performance of line.
- **Develop** resistance, inductance, and capacitance model for the short, medium, and long transmission line.
- **Compute** transmission line voltage regulation and transmission efficiency vs loading.
- **Develop** one-line diagrams, circuits models for major power system components, i.e. three phase generators, transformers lines, and equivalent loads.
- **Use** per unit notation for the system analysis and design.

Detailed Syllabus

Sr. No.	Name of chapter & Details	Hours Allotted
	Section – I	

1	**Inductance of Transmission Line:** Resistance of transmission line, skin effect, proximity effect, partial flux linkages. Inductance of a conductor- due to an internal flux, flux linkage between two points external to an isolated conductor, inductance of single Phase two wire line, Inductance of 3 Phase overhead Line with symmetrical and unsymmetrical spacing. Inductance of composite conductors- concept of Self GMD and Mutual GMD, examples of Inductance computations. Necessity of bundle conductors for EHV and UHV transmission line.	**06**
2.	**Capacitance of Transmission Lines** Introduction, electric field of a long straight conductor, the potential difference between two points due to a charge, Capacitance of single phase two wire line, Capacitance of 3 phase line-symmetrical and unsymmetrical spacing.	**04**
3.	**Performance of Transmission Lines** Classification of overhead transmission lines, Performance of Single Phase short Transmission lines, 3-Phase short Transmission Lines. Effect of load power factor on Regulation and Efficiency. Medium Transmission Lines- end condenser method, Nominal T method and Nominal π method. Long Transmission Lines – Rigorous Method, Generalized circuit constants of Transmission Line.	**06**
4.	**Circle Diagram** Introduction, Receiving end power circle, sending end power circle, use of Circle Diagrams, Universal Power Circle Diagrams, Power Loss Circle Diagram. **Corona: -**Critical disruptive voltage, corona loss, line design based on corona, advantages and disadvantages of corona.	**05**
	TOTAL	**21**
	Section-II	
5.	**Representation Of Power System Components:** One-line diagram, The impedance and reactance diagram, per-unit quantities, selection of base for Per Unit Quantities, per-unit Impedance of three winding transformer, advantages of per-unit computation.	**03**
6.	**Symmetrical Fault Analysis:** Symmetrical faults on 3 phase system, limitation of fault current, percentage reactance and base kVA, reactor control of short circuit currents, location of reactors, Steps for Symmetrical fault calculations.	**04**
7.	**Symmetrical Components:** Symmetrical component transformation (voltage and current), phase shift in star-delta transformers, sequence impedance and sequence network of power system. Sequence impedance in transmission lines, Sequence Impedance and	**07**

	Sequence network of synchronous machine, Sequence impedance and network of transformers.	
8.	**Unsymmetrical Fault Analysis:** Introduction, Unsymmetrical faults on 3phasesystem, analysis of unsymmetrical faults- single line to ground fault, line-to-line fault, and double line to ground fault, sequence networks, and reference Bus for sequence network.	**07**
	TOTAL	**21**

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, blackboard, OHP, etc.
- Assignments based on course contents will be given to the students at the end of each unit/topic and will be evaluated at regular interval Minimum five experiments shall be there in the laboratory related to course contents
- Minimum six tutorials which includes solution of minimum five computer programs in each head

Reference Books:

1. John J. Grainger and W.D. Stevenson Jr., 'Power System Analysis', McGraw Hill International Book Company, 1994.
2. I.J. Nagrath and D.P. Kothari, 'Modern Power System Analysis', Tata McGraw-Hill Publishing Company, New Delhi, 1990.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Publishing Company, New Delhi, 2002.
4. Wadwa. C.L., Electric Power Systems, Wiley Eastern Ltd., New Delhi 2001.
5. Despande M.V., Electrical Power Systems Design, Tata McGraw Hill Publishing Company, New Delhi, 1990.
6. Stevenson W.L., "Elements of Power System Analysis", McGraw Hill, New Delhi, 1999.
7. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing Company Limited, New Delhi, Second Edition, 2003.

Additional resources

- http://nptel.ac.in/courses/108105067/