**17EE3104-POWER SYSTEMS-II**

**(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-2-0 |
| **Pre-requisite:** | Power system-1 | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Objectives:** | To make the student learn about: | |
| 1.The classification of transmission lines and performance calculation of  transmission lines.  2. The reactive power compensation and voltage control.  3. The transients and travelling wave phenomenon on transmission lines.  4. The objective of power system earthing and methods of earthing.  5. The substation equipment and key diagrams of substation.  6. The concept of system modeling and per unit representation. | |
| **Course Outcomes:** | After completing the course the student will be able to: | |
| **CO1** | Understand the classification of transmission lines, representation by suitable equivalent circuits and performance calculation of over head transmission lines. |
| **CO2** | Understand about reactive power compensation and voltage control. |
| **CO3** | Understand the transients and travelling wave phenomenon on transmission lines. |
| **CO4** | Understand the objective of power system earthing and methods of earthing. |
| **CO5** | Gain the knowledge on substation equipment and concepts of EHV and HVDC systems |
| **CO6** | Understand the concept of system modeling and per unit representation. |
| **Course Content:** | **UNIT- I**  **Performance of transmission lines**: Representation of lines-Short transmission lines-Medium transmission lines-Nominal pie and T representation of long lines by distributed parameters-Equivalent T and Pie representation of long transmission lines – Evaluation of ABCD parameters of long lines-Ferranti effect  **UNIT – II**  **Reactive power and voltage control:** Overview of reactive power control-Power flow through a transmission line-Voltage control and line compensation-introduction-Shunt capacitors-Series capacitors-Synchronous compensation, Receiving end power circle diagrams.  **UNIT – III**  **Power system transients:** Introduction-Circuit closing transients -Recovery transient due to removal of a short circuit-Travelling waves on transmission line –Surge impedance and wave velocity-Specification of travelling waves-Reflections and refractions of waves-Different types of terminations-Forked line-Successive reflections-Bewley’s Lattice diagram-Attenuation and distortion.  **UNIT – IV**  **Power system earthing:** Objectives-definitions-Tolerable limits of body currents-Soil resistivity-Earth resistance-Tolerable Step and touch voltages-design of earthing grid-Tower footing resistance-Neutral earthing-Ungrounded and effectively earthed system-Resistance, Reactance, Arc suppression coil earthing and grounding transformers. Arcing grounds-protection against arcing grounds.  **UNIT – V**  **Substations:** Number and size-Location and installation-the main equipment’s in substations- Bus bar arrangements-Key diagram of 66/11KV substation.  **Extra High Voltage transmission:** Introduction-Need for EHV and UHV-Environmental aspects in EHV and UHV lines-EHV systems in India.  **HVDC transmission:** Introduction-Types of DC links-Advantages of DC transmission-incorporating HVDC into AC systems-HVDC systems in India.  **UNIT – VI**  **System modeling:** Representation of transmission lines-circuit representation of synchronous machine-two winding and three winding transformers-Per unit representation and advantages-single line diagram representation-impedance and reactance diagrams-changing the base of per unit quantities. | |
| **Text books**  **&**  **Reference books:** | **Text books:**  1. “Electrical power systems”, by C.L.Wadhwa, New Age International (P)  Limited, 6th Edition, Reprint 2014.  2. “Power system analysis and Design” by B.R.Gupta S.chand company Pvt. Ltd  New Delhi, Reprint-2015.  **Reference books:**   1. “Elements of power system analysis”, by William D.Stevenson. JrMc GRAW-HILL International publication, 4th Edition. 2. “Power System Engineering”, by I.J Nagarath and D.P Kothari, TMH Publications. 3. “A course in power systems”, by J.B.Gupta, S.K.Kataria & sons, Reprint-2016. | |
| **e-Resources:** | <http://nptel.ac.in/courses>  http://iete-elan.ac.in  <http://freevideolectures.com/university/iitm> | |