**Course Objective:**  
The course aim to deliver the basic principle and fundamental analysis techniques for generation, transmission and distribution components of a power system as a first course in power system

1. **General Background(6 hours)**
   1. Power System Evolution
   2. Generation, Transmission and Distribution Components
   3. Energy Sources; hydro, thermal, Nuclear etc.
   4. Basic introduction to renewable energy; Photovoltaic, Wind, geothermal etc
   5. Major electrical components in power station; Alternators, transformers, bus bars, voltage regulators, switch and isolators, metering and control panels
   6. Infinite bus concept
   7. Voltage levels, AC  vs DC Transmission
   8. Single phase and three phase power delivery

1. **Overhead & Underground Transmission(8 hours)**
   1. Line supports, spacing between conductors
   2. Transmission line conductor materials
   3. Stranded and bundled conductors
   4. Overhead line insulators, its types
   5. Voltage distribution along string of suspension insulators, string efficiency
   6. Classification, construction of underground cables, insulation resistance
   7. Dielectric stress in single core/multi core cables
   8. Cable faults and location of faults

1. **Computational Technique(8 hours)**
   1. Single phase representation of three phase system
   2. Impedance and reactance diagram
   3. Single line diagram
   4. Complex powers
   5. Direction of power flow
   6. Per unit system; advantage and applications

1. **Line parameter calculations(10 hours)**
   1. Inductance, resistance and capacitance of a line
   2. Inductance of line due to internal & external flux linkages
   3. Skin & proximity effect
   4. Inductance of single phase two wire line, stranded & bundled conductor consideration, concept of G.M.R and G.M.D, inductance of 3 phase line; equilateral and unsymmetrical spacing
   5. Transposition, inductance of double circuit 3 phase lines
   6. Concept of G.M.R and G. M.D for capacitance calculations
   7. Capacitance calculations of single phase two wire line, stranded & bundled conductor consideration, capacitance of 3 phase line; equilateral and unsymmetrical spacing, double circuit
   8. Earth effect in capacitance of a line

1. **Transmission line modeling(4 hours)**
   1. Classification of a lines based on short, medium and long lines
   2. Representation of ‘Tee’ and ‘Pi’ of medium lines; calculation of ABCD parameters
   3. Distributed Parameter model of Long lines; calculation of ABCD parameters
   4. Equivalent ‘Tee’ and ‘Pi’ of long lines

1. **Performance Analysis(8 hours)**
   1. Sending and receiving end quantities analysis
   2. Voltage regulation & efficiency calculation of transmission lines
   3. Transmission line as source and sink of reactive power
   4. Real and reactive power flow through lines
   5. Surge impedance loading
   6. High capacitance effect of long lines
   7. Reactive compensation of transmission lines

**References:**

1. Power System Analysis by W.D. Stevension, Tata McGraw Hill Publications
2. Modern Power system analysis by I.J Nagrath and D.P Kothari, Tata McGraw Hill Publications
3. A text book on Power System Engineering by Chakraborty, M.L. sony, P.V. Gupta et al., Dhanpat rai & Co.
4. Electric power Generation, Transmission & Distribution by S.N. Singh, Prentece Hall

**Evaluation Scheme:**  
The questions will cover all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below:

|  |  |  |
| --- | --- | --- |
| **Chapters** | **Hours** | **Marks Distribution\*** |
| 1 | 6 | 10 |
| 2 | 8 | 12 |
| 3 | 8 | 16 |
| 4 | 10 | 16 |
| 5 | 4 | 10 |
| 6 | 8 | 16 |
| Total | 44 | 80 |

**\*Note: There may be a minor deviation in Marks distribution**