EE 543: Power System Planning

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Lecture Schedule** | | Tuesday and Thursday  7:30 pm – 9:00 pm | **Course Type,**  **Semester** | Elective for Electrical Engineering in power stream | | |
| **Credit Hours** | | Three | **Pre-requisite** | Power system analysis at Under graduate level | | |
| **Instructor** | | Dr. Muhammad Kamran | **Contact** | [mkamran@uet.edu.pk](mailto:mkamran@uet.edu.pk) | | |
| **Office** | | Post Graduate Lab  EE Department | **Office Hours** | 7:00 pm to 7:30 pm every Tuesday and Thursday | | |
| **Teaching Assistant** | | None | **Lab Schedule** | See Time Table | | |
| **Course Description** | | This course describes the concepts of Power system planning starting from Generation point to the load end. It will provide all basic concepts essential for further research and expansion in the area of expertise in power Engineering. Especial emphasis on distribution system planning and load forecasting. This course will include modern computer aided techniques adopted for the upgradation of power system. Load characteristics variation and planning accordingly will be taught. Importance and complete chapter on application of distribution transformer will be the part of course. Latest research papers will be the assignments and part of curriculum. Design of sub transmission lines and sub distribution system will be covered followed by transients and power quality issues based on which system planning is carried out.. Load forecasting, tripping, event occurrence and factors affecting planning. Tariff, load and diversity factor calculation with their significance in planning is the part of course. Majority of course is based on practical problems and their numerical solutions | | | | |
| **Measurable Learning Outcomes** | **CLOs** | **Description** | | | **PLOs** | **Level** |
| CLO1 | To get fundamental features and basic building blocks of power system panning with factors affecting Power planning with special emphasis on distribution system | | | PLO1 | High |
| CLO2 | Analyze the performance of various issues and reasons degradation of system showing the effects of weak planning. Remedies and suggested solution of real time problems. | | | PLO2 | High |
| CLO3 | Design perspectives and real time applications with examples and various parameters calculation for cost effective planning | | | PLO3 | High |
| CLO4 | Research based Assignments and presentations related to the course and load forecasting with future consideration | | | PLO3 | Medium |
| **Textbooks** | | **REQUIRED**:  Power system planning by Turan Gonen , 2nd edition  Any related book or article from internet | | | | |
| **Grading Policy vis-à-vis CLO Mapping** | | * Class Assignments/(Presentations) 10%-- CLO4 * Quizzes (~3 to 4; mostly announced) 20% CLO1 to CLO2 * Midterm 30% CLO1 to CLO3 * Final 40% CLO1 to CLO4 | | | | |

**Lecture Plan**

|  |  |  |
| --- | --- | --- |
| **Weeks** | *Topics* | **Readings & CLOs** |
| **0.5\*** | **Introduction**  Introduction to Distribution system planning, Factors affecting the system planning, Load forecasting, substation expansion, station site selection and other factors  . | **CLO1** |
| **3\*** | Present distribution planning techniques, System planning models, Tariff, diversity factor, load factor calculations and problem discussion  Types of distribution system, system expansion planning, operational planning, Optimized applications, Design aspects | **CLO1, CLO3**  **QUIZ 1** |
| **1.5\*** | Future Nature distribution planning, economic factors, technological factor, role of computer in distribution planning  Load characteristics, relation between load and loss factor, load diversification, forecasting, management (Assignment 1) | **CLO1-CLO2**  **Industry based Problems, Assignment CLO4** |
| **3.0\*** | Electricity billing, types of meters, problems, Application of distribution transformer, types of distribution transformer, regulation, efficiency, transformer polarity, equivalent circuits, delta-delta transformer and another configuration | **CLO2, Assignment on CLO4 based concept** |
| **2.5\*** | Presentation of different topics and discussion from research paper, Sub transmission line placement and cost, Distribution system, substation, Planning for the placement of Substation (Real time example) | **CLO1, CLO2 & CLO4** |
| **1.5\*** | Optimal system operation, Generator operating cost, optimal operation recognition, Transformers and regulation calculation effecting planning policy | **CLO3, Quiz 2** |
| **1.0\*** | Problems related to optimization, Optimal unit commitment, Reliability consideration, Security Constrained Optimal Unit Commitment, optimal generation scheduling, Deviation of transmission loss | **CLO2 and CLO3** |
| **2.0\*** | Application of distribution transformer with respect to power planning, Design of primary and secondary distribution system, with complete concepts, | **CLO1-CLO3** |
| **1.0\*, +** | VAR calculations and power factor consideration, daily reactive demand, economic justification of capacitors, Benefits related to released generation capacity | **CLO1-CLO3** |