**17EE4101-POWER SYSTEM ANALYSIS**

**(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Basics of Power Systems, Circuits & Networks | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Objectives:** | Students undergoing this course are expected to : | |
| 1. Learn the steady-state analysis for a balanced three-phase power  system.  2. Lear modeling of the networks in terms of symmetrical components  and sequence network.  3. Learn the functioning of a synchronous machine and its representation.  4. Learn multi-node power systems using an admittance matrix or  impedance matrix representation.  5.Learn the solution of the power flow problem and power system  stability  6. Learn the different numerical integration methods and factors  influencing stability. | |
| **Course Outcomes:** | After completing the course the student will be able to | |
| **CO1** | Analyze a network under symmetrical faults condition |
| **CO2** | Model the networks in terms of symmetrical components and sequence networks. |
| **CO3** | Analyze various types of short circuit faults and calculate the fault currents and voltages in power system. |
| **CO4** | Explain different methods of power flow solutions. |
| **CO5** | Solve optimal power flow problem using different methods of power flow solutions. |
| **CO6** | Demonstrate different numerical integration methods and factors influencing stability. |
| **Course Content:** | **UNIT-I**  **Symmetrical fault analysis:** Introduction, transients on transmission line, short circuit of a synchronous machine, on no load-short circuit of a loaded synchronous machine-selection of circuit breakers, algorithm for short circuit studies-Z bus formulation.  **UNIT-II**  **Symmetrical components:** Introduction, symmetrical component transformation, phase shift in star-delta transformers, sequence impedances of transmission lines, sequence impedance and sequence network of power system, synchronous machine, transmission line and transformers-construction of sequence network of a power system.  **UNIT-III**  **Unsymmetrical fault analysis:** Introduction, symmetrical component analysis of unsymmetrical faults, single-line-to-ground (LG) fault, line-to-line (LL) fault, double line-to-ground (LLG) fault, open conductor faults, bus impedance matrix method for analysis of unsymmetrical shunt faults.  **UNIT-IV**  **Power flow Studies-I:** Necessity of power flow studies, data for power flow studies, derivation of static load flow equations, load flow solutions using gauss seidel method, acceleration factor, load flow solution with and without PV buses, algorithm and flowchart, numerical load flow solution for simple power systems (max. 3-buses), determination of bus voltages, injected active and reactive powers (sample one iteration only) and finding line flows/losses for the given bus voltages.  **UNIT-V**  **Power flow studies-II:** Newton Raphson method in rectangular and polar co-ordinates form, power flow solution with & without PV buses- derivation of jacobian elements, algorithm and flow chart, decoupled and fast decoupled methods, comparison of different power flow methods, D.C load flow.  **UNIT-VI**  **Power system stability:** Introduction, dynamics of a synchronous machine, power angle equation, node elimination techniques, simple systems, steady state stability, transient stability, equal area criterion, numerical solution of swing equation, some factors affecting transient stability, small signal stability analysis. | |
| **Text books**  **&**  **Reference books:** | **Text books:**   1. “Modern power system analysis”, by D.P Kothari and I J Nagarath.TMH, 4th Edition. 2. “Power system analysis and design”, by B.R.Gupta Wheelers publishing, 6th Edition.   **Reference books:**  1. “Elements of power system analysis”, by John J. Grainger and William  D.Stevenson ,Jr TMH.  2. “Electrical power system”, by C.L.Wadhwa New Age publications,  6th Edition. | |
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