Major Specialization: Power System							
Electrical Engineering							
SWAYAM/NPTEL Course List							
Sr. No.	**Semester**	**Name of Course**	**Teaching Scheme**	**Duration**	**Instructor**	**Organizing Institute**	**Credits**
1	V	Computer Aided Power System Analysis	4hrs/ week	12 Weeks	Prof. Biswarup Das	IIT Roorkee	4
2	V	Electrical Distribution System Analysis	4hrs/ week	12 Weeks	Prof. G. B. Kumbhar	IIT Roorkee	4
3	VI	High Power Multilevel Converter – Analysis Design & Operational Issues	4hrs/ week	12 Weeks	Prof. Annandrup	IIT Delhi	4
4	VI	Advanced Electrical Networks	4hrs/ week	12 Weeks	Prof. Shanti Pavan	IIT Madras	4
5	VII	Advances in UHV Transmission and Distribution	4hrs/ week	8 Weeks	Prof. Subbba Reddy B.	IISc Bangalore	4

NPTEL courses for Honors

Course Contents

1. Computer Aided Power System Analysis

Number of Weeks: 12

Week 1: Review of modeling of power system components and formulation of YBUS matrix.

Week 2: Basic power flow equations and Gauss-Seidel load flow method.

Week 3: Newton-Raphson load flow in polar co-ordinate.

Week 4: Newton-Raphson load flow in rectangular co-ordinate and introduction to Fast Decoupled load flow method.

Week 5: Fast Decoupled load flow method and AC-DC load flow method.

Week 6: Sparsity and optimal ordering methods.

Week 7: LU decomposition and contingence analysis.

Week 8: Line outage sensitivity factor and method of least square.

Week 9: Method of least square (contd..) and Introduction to AC state estimation.

Week 10: AC state estimation (contd..) and test for bad data detection.

Week 11: Formulation of YBUS matrix of three phase unbalanced system.

Week 12: Fault analysis in phase domain.

2. Electrical Distribution System Analysis

Number of Weeks: 12

Week 1: Structure of a distribution system

1.1. Distribution feeder configurations and substation layouts.

1.2. Nature of loads.

Week 2: Approximate methods of analysis

2.1. Computation of transformer and feeder loading.

2.2. "K" Factors, voltage drop and power loss calculations.

2.3. Distribution of loads and various geometric configurations.

Week 3, 4, 5: Modeling of distribution system components

3.1. Overhead lines, feeders and cables.

3.2. Single and three phase distribution transformers.

3.3. Voltage regulators.

3.4. Load models.

3.5. Capacitor banks.

3.6. Distributed generation.

Week 6, 7, 8: Distribution system analysis

4.1. Load flow analysis: Backward/forward sweep.

4.2. Load flow analysis: Direct approach.

4.3. Load flow analysis: Direct approach for weakly meshed systems.

4.4. Load flow analysis: Gauss Implicit Z-matrix Method.

4.5. Short-circuit analysis: Sequence-components vs. phase-variable.

4.6. Short-circuit analysis: LG, LLG, LLLG, and LL Faults.

4.7. Short-circuit analysis: Weakly meshed system.

4.8. Applications of distribution system analysis.

3. High Power Multilevel Converters – Analysis Design and Operational Issues

Number of Weeks: 12

Week 1: Half bridge, Full bridge and three phase converters, sinusoidal PWM.

Week 2: 3rd harmonic addition, space vector PWM.

Week 3: Different types of multilevel converters
Cascaded H-Bridge converter – Basic operation.

Week 4: PWM Techniques for CHB converter
Fault tolerant operation of CHB converter.

Week 5: Modular Multilevel converter- Topology, operation and PWM.

Week 6: Capacitor voltage balancing in MMC
Design of components of MMC

Week 7: NPC converter – Basic operation
NPC (3 level) Space vector diagram

Week 8: NPC - PWM technique and midpoint balancing

Week 9: Case study of High Power converters for Motor drive and HVDC application

Week 10: Multi –pulse transformers

Week 11: Gate Drive circuit designing, protection and condition monitoring in high power Converters.

Week 12: Other topologies: conclusion

4. Advanced Electrical Networks

Number of Weeks: 12

(This course is new and going to start in even semester, so the contents will be made available soon)

5. Advances in UHV Transmission and Distribution

Number of Weeks: 12

Module 1: Introduction to the development of Power Transmission.

Module 2: Recent advances in UHV power transmission systems; present status and future growth.

Module 3: General Design Criteria for overhead transmission lines: Methodologies, reliability, wind/ice loading etc.

Module 4: Major Components of HV transmission systems, types of conductor configurations conductor accessories/clamps etc.

Module 5: Towers for UHV transmission: calculations of clearances for power frequency, switching and lightning surges, right of way (ROW) etc.

Module 6: Selection of insulators for light, medium and heavy polluted areas

Module 7: Up-gradation of existing transmission lines

Module 8: Design consideration of UHV substations, Comparison of AIS, Hybrid-AIS and GIS electric and magnetic fields.

Module 9: Insulation coordination for UHV systems

Module 10: Earthling and safety measures for UHV substation.