



The
University
Of
Sheffield.

Electronic &
Electrical
Engineering.

EEE341 ELECTRICAL POWER SYSTEMS

Credits: 10

Course Description including Aims

1. To provide an insight into the main issues concerning the design and performance of a large power supply network.
2. To develop models and analytical techniques, used to calculate the characteristics and specifications of the main items of equipment involved in the generation, transmission and distribution of electrical power.

Outline Syllabus

Power Systems : important operational features, 3-phase networks, unbalanced systems, power calculations, neutral-to-earth potential. **Synchronous machines and Induction generators** : characteristics and performance, calculation of power flow and power factor. **Power Generation** : brief discussion of different types of conventional power station and renewable sources, characteristics, basic performance calculations. **Power Network** : system scheduling, system response, control of power and VAR flow. **Faults** : fault current levels, per unit calculations, fault impedance, fault MVA, fault limiting, circuit breakers. **Transformers** : 3 phase connectors and types of construction, performance, parallel operation, circuit model, load sharing.

Time Allocation

24 lectures and 12 problem solving classes.

Recommended Previous Courses

EEE101 "Circuits and Signals", EEE102 "Power Networks", EEE202 "Electromechanical Energy Conversion"

Assessment

2 hour examination, answer 3 questions from 4

Recommended Books

Weedy, B.M.	<i>Electric Power Systems 3rd edition</i>	Wiley
Grainger, J. J. & Stevenson W.D.	<i>Power Systems Analysis</i>	McGraw-Hill
Harrison, J.A.	<i>An Introduction to Electric Power Systems</i>	Longman
Saadat, H	<i>Power system analysis</i>	McGraw-Hill
Guile, A.E. & Paterson, W	<i>Electrical Power Systems</i>	Pergamon Press

Shepherd, J., Morton, A.H & Spense, L.F	<i>Higher Electrical Engineering</i>	Pitman
Say, M.G	<i>Alternating current machines</i>	Pitman

Objectives

By the end of this module successful students will be able to

1. analyse unbalanced three-phase, three and four wire networks.
2. show awareness of various conventional and renewable methods of power generation.
3. calculate the steady state behaviour of synchronous machines and induction generators and recognise their main control features and performance characteristics when connected to a large power network.
4. use equivalent network models to calculate the effects of power and VAR demands on power system performance.
5. use the per-unit-system in power system specification.
6. use the per-unit system in calculating fault levels under balanced three-phase fault conditions.
7. calculate the performance of three phase transformers and their load sharing capacity when connected in parallel.