

## Liverpool John Moores University

Title: DESIGN AND PLANNING OF MODERN POWER SYSTEMS  
Status: Definitive  
Code: **7010ENGEAT** (117672)  
Version Start Date: 01-08-2016

Owning School/Faculty: Maritime and Mechanical Engineering  
Teaching School/Faculty: Maritime and Mechanical Engineering

Team	Leader
Christian Matthews	Y
Martin Jones	

**Academic Level:** FHEQ7      **Credit Value:** 10      **Total Delivered Hours:** 21

**Total Learning Hours:** 100      **Private Study:** 79

### Delivery Options

Course typically offered: Non Standard Year Long

Component	Contact Hours
Lecture	12
Tutorial	6

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam		70	3
Essay	Essay		30	

### Aims

*To introduce concepts underlying network design and the types of equipment used in typical electrical distribution networks*

### Learning Outcomes

After completing the module the student should be able to:

- 1 Apply the theory of distribution network design and analysis to meet a set of practical requirements.
- 2 Design basic distribution substations and protection systems..
- 3 Assess distribution systems performance using an analytical approach.
- 4 Interpret the requirements of a new power distribution system.

### **Learning Outcomes of Assessments**

The assessment item list is assessed via the learning outcomes listed:

Exam	1	3	4
Assignment	2		

### **Outline Syllabus**

*Types of distribution systems: radial, parallel and mesh distribution.*

*Distribution system planning: economic principles, reliability and effect of the existing network.*

*Loads on distribution networks: static and dynamic loads.*

*Load representation using active and reactive powers: wye and delta connected loads, constant impedance loads, and constant current loads.*

*Characteristic of loads: demand, maximum and average demand, load factor, diversity and coincidence factors.*

*Overhead and underground distribution lines: un-transposed and transposed three-phase lines, line parameters. Concentric neutral cable and tape shielded cable parameters. Impedance and voltage drops.*

*Voltage regulation in distribution systems: auto-transformers and tap changing transformers, line voltage drop compensation.*

*Protection: circuit breakers, relays, arresters, current and voltage transformers, reclosers and fuses.*

*Distribution substations: location and general features. Protection devices, measurement instrumentation, transformers, storage batteries.*

### **Learning Activities**

Lectures supported by handouts.

Tutorials illustrating, by numerical examples, topics covered at lectures.

### **Notes**

This level seven module is delivered in a block release format and will require full-time attendance from all students for the duration of the scheduled delivery period.

The teaching and learning activities in this module will be supported by the research

activities of Professor Emil Levi and Dr Martin Jones of the LJMU Research Center for Electrical and Electronic Engineering (RCEEE).