

Title: ADVANCED POWER ELECTRONICS APPLICATIONS IN POWER

Module Code:

Core/Elective:

Aims & Objectives:

- To introduce the concepts of power electronics based conversion and
- To analyse functional requirements for power converters and intercon-
- To analyse methods and algorithms of control of power electronics
- To discuss and analyse the usage of multiple power electronics
- To assess the application of power electronics devices in Power
- Students will be encouraged to apply methodologies and knowledge

Brief description of the module:

Introduction to Power Electronics Energy Conversion, Fundamentals

Lecture hours: 15

Tutorial hours: 6

Laboratory/Coursework hours:

Other (specify):

LEARNING OUTCOMES:

Knowledge and understanding

1. to identify and analyse the functional blocks of a power electronic (PE) converter;

2. to understand it as Power System(PS) device; to understand the role of controlling reactive and active power flow as an element of PS for PE devices;

3. to know principles of operation and models of PE devices;

4. to understand the operation of PS integrating PE devices;

5. to analyse the behaviour of PSs with a distributed architecture allocating several and different PE devices.

Skills

1. to design a PE device as a PS element;

2. to analyse the behaviour of a PE device as a FACTS device;

3. to develop a model for PE devices either for steady-state regimens or transient ones;

4. to analyse PS behaviour in a well-known simulation environment;

5. to evaluate robustness and controllability of PS including PE

devices as FACTS devices;

6. to assess the integration of FACTS devices into the PS;

OUTLINE SYLLABUS:

Introduction to Power Electronics Energy Conversion; Current and
Fundamentals of measurement methods related to energy quality (1)
Reactive and active power flow control in DC/DC and DC/AC conversion
Dynamic characteristics and control requirements of power electronic
Design of power converters and control methodologies for some of
Stability control and harmonic content control in Power Systems (2)
Analysis of operation of power systems incorporating distributed
Analysis of criteria to decide the application of PE devices into Power

Coursework (including word length and relative weighting):

Nine hours of computer based laboratory work. A formal report is prepared.
The course work contributes 30% to the final module mark.

Examinations (including examination length, number of questions)

There is a 2 1/2 hour written exam with 5 questions out of which students

Directed reading (state if material provided):

Power Electronics Handbook, Muhammad H. Rashid ; ACADEMIC PRESS

Improvement in the Quality of Delivery of Electrical Power

Series: Power Systems, **Benysek**
Power Quality Enhancement Using Custom Power Devices

Flexible AC Transmission Systems (FACTS), edited by

Staff involved

Module leader: Prof. Adriano Carvalho

**Other staff: Prof. Armando Araújo
Prof. António Martins**

Date of last revision:

20 June 2008