ELE4115 POWER SYSTEM PROTECTION

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

The course provides information on issues related to power systems control mechanisms and coordination of power systems.

Course Objectives

- To help students understand the concept of protection and coordination in power systems

Detailed Course Content:

Protection Principles and Components: **[7 Hours]**

Methodology discrimination, derivation of relaying quantities, combined over-current and earth fault relays. Relays, current transformers, voltage transforming devices, H.F capacitors couplers, line traps, circuit breakers, tripping and other auxiliary supplies; Fuses, terminals, and test links. Fault

Calculations: [8 Hours]

Purpose of faults, factors affecting seventy of faults, methods of fault calculation. Calculation of balanced fault conditions, calculation of unbalanced fault conditions

Over current Protection: [8 Hours]

Over-current and earth-fault protection systems; Grading of current settings, Grading of time settings, inverse-time over-current systems. Selection of settings, system analysis grading of relay settings, current transformer requirements, sensitive earth-fault protection. Directional control Feeder

Protection: distance system: [8 Hours]

Operating principles, impedance measuring elements and their characteristics, development of comparators Systems, complex relaying characteristics, switched and polyphase distance protection, Distance protection schemes, practical considerations in the application of distance protection. Feeder

Protection: Pilot Wire and Carrier-Current Systems: [8 Hours]

Basic concepts of unit protection of feeders, types of protection information channels, starting relays longitudinal differentiation protection, pilot wire protection, power line carrier phase-comparison protection, and directional comparison protection.

Over-voltage Protection: [6 Hours]

Over-voltage phenomena in power systems; traveling waves, insulation coordination, protection against internal and external over voltages, surge protection, 95
Protection by SCADA systems

Learning Outcomes

Knowledge and Understanding

Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Fundamental concepts of power system stability
- Factors that influence system stability
- Methods to improve and maintain stability
- Components of protection systems

- The concept of protection zones
- Components used in earthing systems
- Basic structure of different lines and cables
- Types of HVDC links and their control

Intellectual Skills

Having successfully completed the module, you will be able to:

- Analyse simple problems related to system stability
- Appreciate the conflicting nature of the design requirements of a protection system
- Explain the reasons for system earthing
- Appreciate the features of power simulation packages
- Discuss the principles of operation of FACTS
- Appreciate the advantages and disadvantages of HVDC transmission

Practical Skills

Having successfully completed the module, you will be able to:

- Apply equal area stability criteria to simple systems
- Explain principles of operation of protection systems
- Design simple protection systems for transmission lines and transformers
- Comply with power system earthing practices
- Determine temperature rise and ratings of cables and lines

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	Percentage contribution
Course work (Assignments, tests)	40%
Final examination	60%
Total	100%

Recommended and Reference Books

- Weedy B M, "Electric Power Systems", 4th Edition, Wiley 1998
- Glover J D & Sarma M, "Power System Analysis and Design", 3rd Edition, Brooks/Cole 2002
- Grainger J J & Stevenson W D, " Power System Analysis", McGraw Hill 1994
- C.L.Wadhwa, "Electrical Power Systems"
- Nagrath & Kothari, "Modern Power System Analysis"
- Y.G.Paithankar & S.R.Bhinde, "Fundamentals of power system protection"
- Badriram & Vishwakarma, "Power System Protection"
- Ravindranath & Chander, "Power System Protection & Switchgear"

Possible Lecturers:

Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa