

### AEEE454 - Basic Power System Protection

Course Title	Basic Power System Protection				
Course Code	AEEE454				
Course Type	Technical Elective				
Level	BSc (Level 1)				
Year / Semester	4 <sup>th</sup>				
Teacher's Name	Dr. Alexis Polycarpou				
ECTS	6	Lectures / week	3	Laboratories/week	0
Course Purpose	The aim of the course is to familiarize students with various concepts and principles of power system protection in order to implement their knowledge to perform calculations regarding fuse grading and relay setting definition to achieve discrimination in power system protection.				
Learning Outcomes	<p>By the end of the course, students must be able to:</p> <ol style="list-style-type: none"> <li>1. Remember what is switchgear, isolators, circuit breakers. Understand circuit breaker operation.</li> <li>2. Analyse operating characteristics, apply the mathematical principle of protecting radial feeder circuits with fuses</li> <li>3. Understand the operation of the various types of oil, air, sf6, vacuum circuit breakers, and explain their construction electrical principles.</li> <li>4. Evaluate unit and non-unit protection, Analyse characteristics of zones of protection. Evaluate the parameters of Relays protecting a radial system.</li> <li>5. Understand primary and secondary protection schemes, describe dual main protection schemes.</li> </ol>				
Prerequisites	AEEE351	Corequisites	None		
Course Content	<ul style="list-style-type: none"> <li>• Introduction to switchgear: general operational characteristics of circuit breakers, isolators, fuses, arc principles, contact erosion.</li> <li>• The fuse: operating characteristics of a fuse, rupture time, energy let through, use of fuses for protection of radial feeders.</li> <li>• Types of circuit breaker: oil, air, vacuum, sf6. Construction of various types, operational limitations of each model.</li> <li>• The protection overlay: unit protection, current differential scheme, non-unit protection, zones of operation of protection device, relay parameter setting.</li> <li>• Backup protection: primary and secondary protection, dual/main protection schemes. Relay Plug Multiplier setting calculations.</li> </ul>				

<p>Teaching Methodology</p>	<p>Students are taught the course through lectures (3 hours per week) in classrooms or lectures theatres, by means of traditional tools or using computer demonstration.</p> <p>Auditory exercises, where examples regarding matter represented at the lectures, are solved and further, questions related to particular open-ended topic issues are compiled by the students and answered, during the lecture or assigned as homework.</p> <p>Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration. Students are also advised to use the subject's textbook or reference books for further reading and practice in solving related exercises. Tutorial problems are also submitted as homework and these are solved during lectures or privately during lecturer's office hours.</p> <p>Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constraints and revision timetable. The final assessment of the students is formative and is assured to comply with the subject's expected learning outcomes and the quality of the course.</p>
<p>Bibliography</p>	<p><b><u>Textbooks:</u></b></p> <ul style="list-style-type: none"> <li>• Fundamentals of power system protection, Y.G. PAITHANKAR, S.R. BHIDE, 2<sup>nd</sup> edition, 2010, ISBN: 978-81-203-4123-4</li> </ul> <p><b><u>References:</u></b></p> <ul style="list-style-type: none"> <li>• Power system protection, IEEE press series on Power engineering, 1999, Paul, M. Anderson, IEEE, ISBN: 0-7803-3427-2.</li> <li>• PPT presentations provided by the lecturer.</li> </ul>
<p>Assessment</p>	<p>The Students are assessed via continuous assessment throughout the duration of the Semester, which forms the Coursework grade and the final written exam. The coursework and the final exam grades are weighted 40% and 60%, respectively, and compose the final grade of the course.</p> <p>Mid-term written exams are used for the continuous assessment of the students, the assessment weight, date and time of each type of continuous assessment is being set at the beginning of the semester via the course outline. An indicative weighted continuous assessment of the course is shown below:</p> <ul style="list-style-type: none"> <li>• Mid-Term written exams 100%</li> </ul> <p>Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constrains and revision timetable.</p> <p>The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course.</p>
<p>Language</p>	<p><b>English</b></p>