AEEE532 - Faulted Power Systems

Course Title	Faulted Power Systems				
Course Code	AEEE532				
Course Type	Technical Elective				
Level	MSc (Level 2)				
Year / Semester	1 or 2				
Teacher's Name	Dr Alexis Polycarpou				
ECTS	8	Lectures / week	3	Laboratories/week	0
Course Purpose	The aim of the course is to provide knowledge to students to be able to analyse and evaluate the effect of various faults on Power Systems. All types of balanced and unbalanced faults are considered.				
Learning Outcomes	By the end of the course, students must be able to: 1. Evaluate per unit quantities, changing the base of per-unit quantities, per unit analysis of power systems. 2. Analyse structure of power systems, need for power system fault analysis, and characteristics of power system faults. 3. Evaluate balanced three-phase current and voltage phasors, symmetrical components of unbalanced voltage and current phasors, apparent power in symmetrical component terms, sequence components of balanced / unbalanced three-phase impedances, advantages of symmetrical components frame of reference. 4. Evaluate of balanced three-phase to earth short-circuit faults, balanced three-phase clear of earth short-circuit faults, unbalanced one-phase to earth short-circuit faults, unbalanced phase-phase or two-phase short-circuit faults, unbalanced two-phase to earth short-circuit faults, unbalances one-phase open circuit faults, unbalances two-phase open circuit faults. 5. Analyse the impact of simultaneous short-circuit faults at the same locations, simultaneous short-circuit faults at different locations, simultaneous short-circuit and open circuit faults at the same locations, simultaneous short-circuit and open circuit faults at distribution transformers.				
Prerequisites	AEEE521, AEEE522	Corequisites	None		
Course Content	• **Review of per unit system:** per unit quantities, changing the base of per-unit quantities, per unit analysis of power systems. • **Sequence impedances:** of transmission lines, machines and transformers. • **Introduction to power systems faults:** structure of power systems, need for power system fault analysis, characteristics of power system faults • **Symmetrical components of a three-phase power system:**				

	balanced three-phase current and voltage phasors, symmetrical components of unbalanced voltage and current phasors, apparent power in symmetrical component terms, sequence components of balanced / unbalanced three-phase impedances, advantages of symmetrical components frame of reference • **Analysis of balanced and unbalanced faults:** balanced three-phase to earth short-circuit faults, balanced three-phase clear of earth short-circuit faults, unbalanced one-phase to earth short-circuit faults, unbalanced phase-phase or two-phase short-circuit faults, unbalanced two-phase to earth short-circuit faults, unbalances one-phase open circuit faults, unbalances two-phase open circuit faults • **Simultaneous faults:** simultaneous short-circuit faults at the same locations, simultaneous short-circuit faults at different locations, simultaneous short-circuit and open circuit faults at the same locations, simultaneous short-circuit and open circuit faults at distribution transformers
Teaching Methodology	Students are taught the course through lectures (3 hours per week) in computer labs, by means of traditional tools and using computer demonstration. 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. Simulated circuits 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 creating circuits during their spare time. 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 as simulation capabilities are also assessed.
Bibliography	**Textbooks:** • Power Systems Analysis, John Grainger, William Stevenson, Published by McGraw-Hill Education, United States , ISBN 10: 1259008355 ISBN 13: 9781259008351, 2016 . • Power Systems Modelling and Fault Analysis, N. Tleis, Newnes, 2008, ISBN-13: 978-0750680745, 2008. **References:** • Power system analysis & design, J Duncan Glover; Thomas J Overbye; Mulukutla S Sarma, 6th edition, 978-1-305-63213-4, 2017.
Assessment	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. Mid-term test assessments are used for the continuous assessment of the students, Group research project is also used. 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: • Mid-Term written exams 70% • Group Research project 30% Students are prepared for final exam, by revision on the matter taught, and problem solving and are also trained to be able to deal with time constrains. 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.
Language	**English**