AEEE349 – Generation and Transmission of Electrical Energy

Course Title	Generation and Transmission of Electrical Energy				
Course Code	AEEE349				
Course Type	Compulsory				
Level	BSc (Level 1)				
Year / Semester	4th (Spring)				
Teacher's Name	Dr. Alexis Polycarpou				
ECTS	5	Lectures / week	3	Laboratories/week	0
Course Purpose	The aim of the course is to familiarize students with the various concepts and principles of electrical power system generation, and transmission in order to implement their knowledge to perform calculations regarding delivered power, cable parameters such as capacitance and impedance, short and medium transmission lines, and system stability. Per unit system theory, and transformer operation is also covered.				
Learning Outcomes	By the end of the course, students must be able to: 1. Understand basic principles of Electricity generation and transmission and distribution. Acquire basic knowledge relating to the Principle of operation of a Generator and creation of three phase sinusoidal voltages. 2. Evaluate Power principles in 3-phase AC systems: Definition and calculations of Active, Reactive and Apparent power. Calculation of Power with circuit analysis. 3. Evaluate the parameters, losses, and potential difference for any section of a radial system. Understand how the per unit system analysis method is used to analyze a multy node multy voltage level system. 4. Analyse basic Transmission system considerations: Transmission line cable parameters, series capacitance and impedance, short and medium transmission line models, Ideal Transformer operation and basic magnetic principles. 5. Understand the process of symmetrical component theory for three phase system representation. Derive mathematically how the 'A' operator matrix is obtained as well as how to implement the inverse matrix, and evaluate the symmetrical phasors of the currents or voltages of an unbalanced system with the use of symmetrical components.				
Prerequisites	AEEE222	Corequisites	None		
Course Content	Course contents: • Revision of mathematical techniques used for power system analysis. • Impedance characteristics and components polar and rectangular format.				

	• Active Reactive and Apparent Power in three phase systems. Mathematical formulation relating to the identification of power factor at a system. • Generation, transmission, distribution system characteristics in Cyprus. Principle of power generation using oil fuelled generator. • Generator operation and three phase sinusoidal voltages. • Basic magnetic principles, operation of transformer in Power systems. • Transformer circuit diagram. • Per unit system formulation, definitions and base quantities for various parameters. Parameter calculation and mathematical identification of per unit voltage and current quantities at various points of a radial system. • Introduction of Transmission system: Transmission system consideration, Cable parameters, series capacitance and impedance of a line, short, medium transmission line model analysis. • Sequence component theory, derivation of formulation through sequence diagrams. A operator matrix and calculations of phase voltages and currents, Inverse A operator matrix and calculation of symmetrical components from phase currents • Revision and exam preparation instructions.
Teaching Methodology	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. 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. Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration and can also be downloaded from the e-learning platform or the lecturer's webpage. 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.
Bibliography	**Textbooks:** • Power Systems Analysis, John Grainger, William Stevenson, Published by McGraw-Hill Education, United States , ISBN 10: 1259008355 ISBN 13: 9781259008351, 2016 . • Power system analysis & design, J Duncan Glover; Thomas J Overbye; Mulukutla S Sarma, 6th edition, 978-1-305-63213-4, 2017. **References:** • Elements of power system analysis, William D, Stevenson Jr, 4th ed. Mc Graw-Hill, 2002.
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 written exams are used for the continuous assessment of the students, the assessment weight, and estimated dated 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 100% 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. 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**