

<b>Subject</b>	Electrical Power Systems II	<b>Subject Code</b>	EE441						
<b>Semester/year</b>	Semester 1/2016	<b>Date Prepared</b>	10 <sup>th</sup> February 2016						
<b>Lecturer</b>	Dr. Peter Kiss	<b>Credit Hours (PNG standard)</b>	15						
<b>Period</b>	15 weeks	<b>Credit Hours (Engineering Accreditation Standard)</b>	3						
<b>Subject Synopsis</b>	Automatic Generation Control, Power frequency control, control of voltage and reactive power, automatic voltage regulator (AVR), symmetrical components, short-circuit calculations, symmetrical three-phase faults, unsymmetrical faults, power system transients, power system protection.								
<b>Contact hours</b>	Lecture: 3 hours/week Tutorial: 1 hour/week Laboratory: 0 hours/week								
<b>Evaluation</b>	40 % Continuous Assessment 60 % End of Semester Examination								
<b>Learning Outcomes</b>	LO1: Calculating with the differential equations and representative techniques of transmission lines. LO2: Understanding the stability limits of the transmission lines under steady state conditions. LO3: Calculate the variation of frequency with time for single-area and two-area systems for step-load increases for both controlled and uncontrolled cases. LO4: Explain the methods of controlling the voltage and reactive powers in a system. LO5: Calculate the fault levels in a system for different types of fault. LO6: Introducing the sequential networks, calculating under unbalanced conditions. LO7: Analyse transient processes in power systems, calculate switching and lightning over-voltages in simple systems..								
<b>Assessment Methods</b>	Distribution	(%)	LO1	LO2	LO3	LO4	LO5	LO6	LO7
	Quizzes	12%	X	X	X	X	X	X	X
	Tests	28%	X	X	X	X	X	X	X
	Final Exam	60%	X	X	X	X	X	X	X
<b>References Used in Class</b>	Glover J.D, Sarma M.S. and Overbye T.J, Power System Analysis and Design, Cengage Learning, 5th Edition, 2012. Weedy B.M. and Cory B.J., Electric Power Systems, John Wiley, 4th Edition, 2012.								
<b>Additional References</b>	Elgerd O.I, Electric Energy Systems Theory – An Introduction, McGraw Hill, 2nd Edition, 2014 Stevenson W.D. Jr.: Elements of Power System analysis, 4th Edition, MGrav Hill.								

**Program Outcomes (Electrical and Communications Engineering)**

PO1	An ability to apply the knowledge of mathematics, science and Engineering in all aspects of Electrical Engineering.
PO2	An ability to design and conduct experiments, as well as to analyse and interpret data.
PO3	An ability to design a system, component, or process to meet desired need within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
PO4	An ability to apply the techniques of using appropriate tools to investigate, analyse, design, simulate and/or fabricate/commission complete systems.
PO5	An ability to identify, analyse, formulate, design, simulate and/or fabricate/commission complete systems for engineering problems.
PO6	An ability to communicate effectively and to prepare formal technical plans leading to solutions and detailed reports for electrical systems.
PO7	An ability to work on multidisciplinary teams and comprehend his/her scope of work, deliverables and issues in which able to lead the team towards goal.
PO8	Possess an understanding of professional, safety and ethical responsibility.
PO9	Broad understanding of the impact of engineering solutions in a global, economic, environmental, and societal context.
PO10	Recognition of the need for, and an ability to engage in life-long learning to upgrade to higher learning and research activities.
PO11	Comprehensive knowledge of contemporary issues due to changing technical scenario.
PO12	An ability to manage projects in multidisciplinary environments and apply management techniques, skills, and project management tools necessary for engineering practice.

Chapter	Topic	Week	Topic Outcomes (TO)	LO	PO	Delivery Methods
1	<b>Steady State Operation of Transmission Lines</b>	1-3	<ul style="list-style-type: none"> <li>• Medium and short line approximation</li> <li>• Transmission line differential equations</li> <li>• Equivalent <math>\Pi</math>-circuit, A, B, C, D parameters</li> <li>• Lossless lines, steady state stability limit</li> <li>• Maximum power flow</li> </ul>	LO1 LO2		Lectures, Tutorials
2	<b>Automatic Generation Control</b>	4-6	<ul style="list-style-type: none"> <li>• Frequency control and power-frequency relation</li> <li>• Transfer function model for control</li> <li>• Generator characteristics and governor setting</li> <li>• Effect of tie-line power on interconnected systems</li> </ul>	LO3		Lectures, Tutorials
3	<b>Control of Voltage and Reactive Power</b>	7-9	<ul style="list-style-type: none"> <li>• Injection of reactive power and synchronous condensers</li> <li>• Tap changing transformers</li> <li>• Induction regulators and AVR</li> <li>• Economics of reactive power generation</li> <li>• Reactive power compensation</li> </ul>	LO4		Lectures, Tutorials
4	<b>Short-Circuit Calculations</b>	10-13	<ul style="list-style-type: none"> <li>• Three-phase symmetrical fault,</li> <li>• Symmetrical components</li> <li>• Unsymmetrical faults</li> <li>• Sequence reactances</li> <li>• Current limiting reactors</li> <li>• Fault level in typical systems</li> <li>• Neutral ground</li> </ul>	LO5 LO6		Lectures, Tutorials
5	<b>Power System Transients</b>	14-15	<ul style="list-style-type: none"> <li>• Generation of overvoltages</li> <li>• Propagation of surges</li> <li>• Transmission and reflection at discontinuities</li> <li>• Switching transient calculation</li> <li>• Current chopping</li> </ul>	LO7		Lectures, Tutorials

Mid-semester break is after week 7 according to the University Almanac. Week after the break is week 8.

Assessment Details			
Type	Group/ Individual	Learning Domain	Mark
Quizzes	Individual	Cognitive	12
Tests	Individual	Cognitive	28
Final Examination	Individual	Cognitive	60

**Assessment schedule:**

		Week N <sup>o</sup> .														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ass. Methods	Quizzes				X		X		X		X		X		X	
	Tests								X						X	

**LO-PO mapping:**

		Programme Outcomes (POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Learning Outcomes LOs	LO 1	X			X	X							
	LO 2	X		X	X	X			X				
	LO 3	X		X	X								
	LO 4	X	X		X	X	X						
	LO 5	X	X	X			X		X	X			
	LO 6	X				X			X		X		
	LO 7	X		X		X	X	X	X		X		

Prepared By: Dr. Péter Kiss

Checked & Approved By:

Date: 10<sup>th</sup> February 2016.

(Head of the department ECE)  
Date:

**Remarks:**

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