

<b>B.E ELECTRICAL AND ELECTRONICS ENGINEERING(EEE) CHOICE BASED CREDIT SYSTEM (CBCS) SEMESTER -VI</b>			
<b>POWER SYSTEM ANALYSIS – 1 (Core Subject)</b>			
Subject Code	15EE62	IA Marks	20
Number of Lecture Hours/Week	04	Exam Hours	03
Total Number of Lecture Hours	50	Exam Marks	80
<b>Credits - 04</b>			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• To introduce the per unit system and explain its advantages and computation.</li> <li>• To explain the concept of one line diagram and its implementation in problems.</li> <li>• To explain the necessity and conduction of short circuit analysis.</li> <li>• To explain analysis of three phase symmetrical faults on synchronous machine and simple power systems.</li> <li>• To discuss selection of circuit breaker.</li> <li>• To explain symmetrical components, their advantages and the calculation of symmetrical components of voltages and currents in un-balanced three phase circuits.</li> <li>• To explain the concept of sequence impedance and its analysis in three phase unbalanced circuits.</li> <li>• To explain the concept of sequence networks and sequence impedances of an unloaded synchronous generator, transformers and transmission lines.</li> <li>• To explain the analysis of synchronous machine and simple power systems for different unsymmetrical faults using symmetrical components.</li> <li>• To discuss the dynamics of synchronous machine and derive the power angle equation for a synchronous machine</li> <li>• Discuss stability and types of stability for a power system and the equal area criterion for the evaluation of stability of a simple system. ■</li> </ul>			
<b>Module-1</b>			<b>Teaching Hours</b>
<b>Representation of Power System Components:</b> Introduction, Single-phase Representation of Balanced Three Phase Networks, One-Line Diagram and Impedance or Reactance Diagram, Per Unit (PU) System, Steady State Model of Synchronous Machine, Power Transformer, Transmission of electrical Power, Representation of Loads. ■			<b>10</b>
<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> – Remembering, L <sub>2</sub> – Understanding, L <sub>3</sub> – Applying, L <sub>4</sub> – Analysing.		
<b>Module-2</b>			
<b>Symmetrical Fault Analysis:</b> Introduction, Transient on a Transmission Line, Short Circuit of a Synchronous Machine(On No Load), Short Circuit of a Loaded Synchronous Machine, Selection of Circuit Breakers. ■			<b>10</b>
<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> – Remembering, L <sub>2</sub> – Understanding, L <sub>3</sub> – Applying, L <sub>4</sub> – Analysing.		
<b>Module-3</b>			
<b>Symmetrical Components:</b> Introduction, Symmetrical Component Transformation, Phase Shift in Star-Delta Transformers, Sequence Impedances of Transmission Lines, Sequence Impedances and Sequence Network of Power System, Sequence Impedances and Networks of Synchronous Machine, Sequence Impedances of Transmission Lines, Sequence Impedances and Networks of Transformers, Construction of Sequence Networks of a Power System, Measurement of sequence Impedance of Synchronous Generator. ■			<b>10</b>
<b>Revised Bloom's Taxonomy Level</b>	L <sub>2</sub> – Understanding, L <sub>3</sub> – Applying, L <sub>4</sub> – Analysing, L <sub>5</sub> – Evaluating.		
<b>Module-4</b>			
<b>Unsymmetrical Fault Analysis:</b> Introduction, Symmetrical Component Analysis of Unsymmetrical Faults, Single Line-To-Ground (LG) Fault, Line-To-Line (LL) Fault, Double Line-To-Ground (LLG) Fault, Open Conductor Faults. ■			<b>10</b>
<b>Revised Bloom's Taxonomy Level</b>	L <sub>1</sub> – Remembering, L <sub>2</sub> – Understanding, L <sub>3</sub> – Applying, L <sub>4</sub> – Analysing.		

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<b>15EE62 POWER SYSTEM ANALYSIS – 1 (Core Subject) (continued)</b>				
<b>Module-5</b>				<b>Teaching Hours</b>
<b>Power System Stability:</b> Introduction, Dynamics of a Synchronous Machine, Power Angle Equation Salient and Non – Salient pole Synchronous Machines, Simple Systems, Steady State Stability, Transient Stability, Equal Area Criterion, Factors Affecting Transient Stability. ■				<b>10</b>
<b>Revised Bloom's Taxonomy Level</b>		L <sub>1</sub> – Remembering, L <sub>2</sub> – Understanding, L <sub>3</sub> – Applying, L <sub>4</sub> – Analysing.		
<b>Course outcomes:</b> At the end of the course the student will be able to:				
<ul style="list-style-type: none"> <li>• Show understanding of per unit system, its advantages and computation.</li> <li>• Show the concept of one line diagram and its implementation in problems</li> <li>• Perform short circuit analysis on a synchronous machine and simple power system to select a circuit breaker for the system.</li> <li>• Evaluate symmetrical components of voltages and currents in un-balanced three phase circuits.</li> <li>• Explain the concept of sequence impedance and sequence networks of power system components and power system.</li> <li>• Analyze three phase synchronous machine and simple power systems for different unsymmetrical faults using symmetrical components.</li> <li>• Discuss the dynamics of synchronous machine, stability and types of stability.</li> <li>• Discuss equal area criterion for the evaluation of stability of a simple system under different fault conditions. ■</li> </ul>				
<b>Graduate Attributes (As per NBA)</b> Engineering Knowledge, Problem analysis, The Engineer and Society, Ethics				
<b>Question paper pattern:</b>				
<ul style="list-style-type: none"> <li>• The question paper will have ten full questions carrying equal marks. Each full question consisting of 16 marks.</li> <li>• There will be two full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub question covering all the topics under a module.</li> <li>• The students will have to answer five full questions, selecting one full question from each module. ■</li> </ul>				
<b>Textbook</b>				
1.	Modern Power System	D. P. Kothari	McGraw Hill	4 <sup>th</sup> Edition, 2011
<b>ReferenceBooks</b>				
1	Elements of Power System	William D. Stevenson Jr	McGraw Hill	4 <sup>th</sup> Edition, 1982
2	Power System Analysis and Design	J.Duncan Glover et al	Cengage	4 <sup>th</sup> Edition, 2008
3	Power System Analysis	Hadi Sadat	McGraw Hill	1 <sup>st</sup> Edition, 2002