SYLLABUS

ESE-352 -- ELECTROMECHANICAL ENERGY CONVERTERS

SESSION	TOPIC
1	**ELECTROMECHANICAL ENERGY CONVERTER FUNDAMENTALS** • Machinery Principles: Generators and Motors • Electrical Machines in Daily Life • Rotational Motion and Power Relationships • The Magnetic Field • Faraday's Law – Induced Voltage from a Time-Changing Magnetic Field • Production of Induced Force on a Wire • Induced Voltage on a Conductor Moving in a Magnetic Field • The Linear DC Machine
2	**AC MACHINE FUNDAMENTALS** • Rotating Loop • Rotating Magnetic Field • Flux Distribution in AC Machines • Induced Voltage in AC Machines • Induced Torque • Winding Insulation • AC Machine Power Flows and Losses • Assign Team Model #1
3	• Real, Reactive, and Apparent Power in AC Circuits • Review Linear DC Machine • Review AC Machine Fundamentals
4	**SYNCHRONOUS GENERATORS** • Synchronous Generator Construction • The Speed of Rotation of a Synchronous Generator • The Internal Generated Voltage of a Synchronous Generator • The Equivalent Circuit of a Synchronous Generator • The Phasor Diagram of a Synchronous Generator • Power and Torque in Synchronous Generators • Measuring Synchronous Generator Model Parameters • The Synchronous Generator Operation • Synchronous Generator Ratings
5	**SYNCHRONOUS MOTORS** • Rotating Magnetic Field • Equivalent Circuit • Steady-State Synchronous Motor Operation • Starting Synchronous Motors • Phasor Diagram Comparison of Synchronous Generators and Synchronous Motors • Synchronous Motor Ratings
6	**REVIEW**
7	**FIRST EXAM**
8	**EXAM REVIEW / INDUCTION MOTORS** • Induction Motor Construction • Basic Induction Motor Concepts of Slip and Frequency • The Equivalent Circuit of an Induction Motor • Power and Torque in Induction Motors • Induction Motor Torque-Speed Characteristics • Variations in Induction Motor Torque-Speed Characteristics • Improvements in Induction Motor Design • Starting Induction Motors • Speed Control • The Induction Generator • Induction Motor Ratings
9	**DC MACHINERY FUNDAMENTALS** • Rotating Loop between Curved Pole Faces • Commutation in a Four-Loop DC Machine • Commutation and Armature Construction in Real DC Machines

NOTES:

- Homework assignments are due at next session.
- The weekly quiz will cover material discussed during previous session.
- Final grade will be determined as follows:

Homework and Weekly Quiz	34%
First Exam	33%
Second Exam	33%
	100%

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ESE-352 -- ELECTROMECHANICAL ENERGY CONVERTERS

SESSION	TOPIC
	• Problems with Commutation in Real Machines • The Internal Generated Voltage and Induced Torque Equations • The Construction of DC Machines • Power Flow and Losses in DC Machines • Assign Team Model #2
10	**DC MOTORS AND GENERATORS** • The Equivalent Circuit of a DC Motor • The Magnetization Curve of a DC Machine • Separately Excited DC Motors and Shunt DC Motors • The Permanent-Magnet DC Motor • The Series DC Motor • The Compounded DC Motor • DC Motor Starters • DC Motor Efficiency • The Separately Excited Generator • The Shunt DC Generator • The Series DC Generator • The Cumulatively Compounded DC Generator • The Differentially Compounded DC Generator
11	**SINGLE-PHASE AND SPECIAL PURPOSE MOTORS** • The Universal Motor • Single Phase Induction Motor • Starting Single-Phase Induction Motors • Speed Control of Single-Phase Induction Motors • The Circuit Model of a Single-Phase Induction Motor
12	**OVERVIEW OF SINGLE-PHASE AND SPECIAL PURPOSE MOTORS** • Split Phase Motor • Capacitor-Start Motor • Permanent Split Phase Capacitor Motor • Capacitor Start, Capacitor Run Motor • Shaded Pole Motor • Reluctance Motor • Hysteresis Motor • Stepper Motor • Brushless DC Motor
13	**REVIEW**
14	**REVIEW**
15	**SECOND EXAM**

NOTES:

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- The weekly quiz will cover material discussed during previous session.
- Final grade will be determined as follows:

Homework and Weekly Quiz	34%
First Exam	33%
Second Exam	33%
	100%