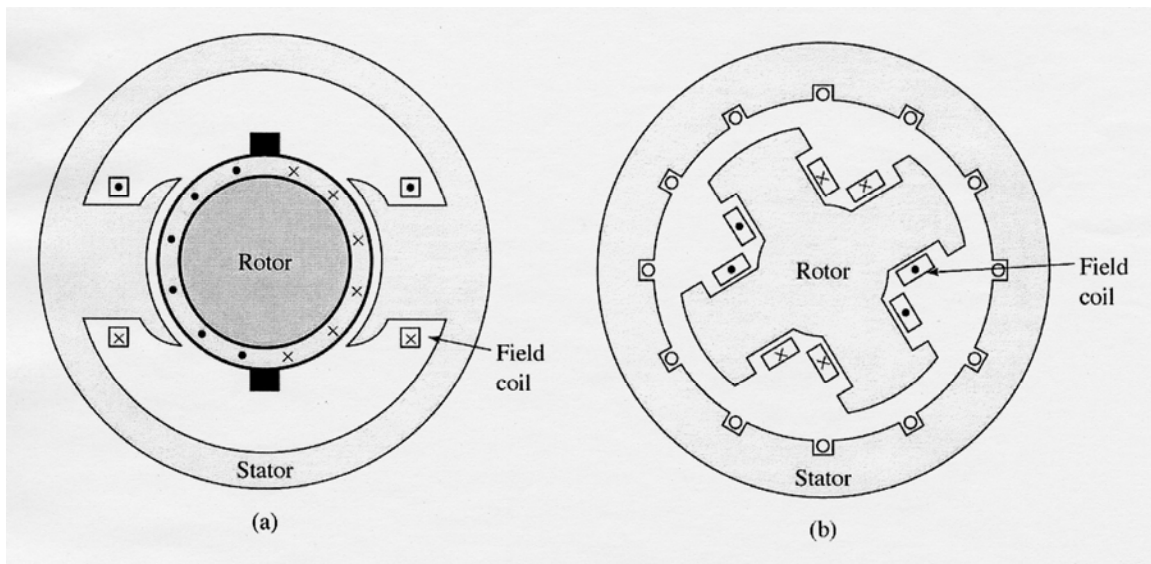


**University of Colorado at Denver and Health
Sciences Center
College of Engineering and Applied Science
Electrical Engineering Department**

Fall Semester, 2009

**EE 3164
Energy Conversion
Course Syllabus**



**Instructor:
Jeff D. Selman, MSEE, P.E.**

**University of Colorado at Denver and Health Sciences Center
College of Engineering and Applied Science
Electrical Engineering Department**

EE 3164: Energy Conversion – Fall 2009 8/18/09

Course Description: Energy conversion concepts which include theory of transformers, basic rotating energy converters including direct current machines, synchronous and induction machines, and applications of each machine.

Text: Electric Machinery and Power System Fundamentals, Stephen J. Chapman, 1st Edition, McGraw Hill, 2002. ISBN 0-07-229135-4

Supplementary Material (not required): Schaum's Outline on Electric Machines and Electromechanics, Second Edition, Syed Nasar, McGraw-Hill, ISBN 0-07-045994-0

Topics to be covered in the Course and Exam Schedule:

I. Magnetic Circuit Fundamentals, Power in Single Phase Circuits: Rotational Energy, Magnetic Field, Flux, Flux Density, B-H Characteristics, Reluctance, Permeability, Magnetic Field Intensity, Magnetic Materials, Equivalent Magnetic Circuits, AC Excitation, Saturation, Faraday's Law, Motor/Generator Action, Review of AC Circuits, Real Power, Reactive Power, Apparent Power, Power Triangle, Phasor Diagrams, Power Factor, Power Factor Correction (Chapter 1).

II. 3-Phase Circuits: Phasor Diagrams, Voltage/Current/Power Relationships, Wye/Delta Connections, Analysis of Balanced 3-Phase Circuits, Single-Phase Equivalent, 2-Wattmeter Method and Calculations, One-Line Diagram (Chapter 2).

Exam I (in class)

III. Transformers: Construction and Major Components, Principles of Operation, Ideal Transformer, Voltage-Current Relationship, Flux Balance Equation, Real Transformer, Polarity, Magnetization Current, Equivalent Circuit, Open/Short-Circuit Tests, Per-Unit System, Voltage Regulation and Efficiency, Phasor Diagrams, Autotransformers, 3-Phase Transformers (Chapter 3)

IV. D.C. Machines (Motor/Generator): Construction and Major Components, Principles of Operation, Commutation, Equivalent Circuit, Series/Shunt/Compound Field Winding Configurations, Losses, Efficiency, Voltage/Speed Regulation, Speed Control of Motors, Torque-Speed Characteristics (Chapter 8)

Exam II (in class)

V. Synchronous Machines (Generator/Motor): Construction and Major Components, Principles of Operation, Excitation, Equivalent Circuit, Voltage-Current Relationship,

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T-Th 5:30 pm – 6:45 pm Location: WC-144

Phasor Diagrams, Open/Short Circuit Characteristics, Steady State Power Angle/Operating Characteristics, Constant Power/Constant Excitation, Power Factor, Efficiency, Voltage Regulation, Losses, Ratings, Single Machine Connected to Power System (Chapter 5)

VI. Polyphase Induction Motors: Construction and Major Components, Principles of Operation, Equivalent Rotor/Stator Circuit, Torque/Speed Characteristics, Power Factor, Losses and Efficiency, Speed Control, DC/No-Load/Locked-Rotor Tests (Chapter 7)

Exam III (in class, during Finals Week)

Instructor: Jeff D. Selman

Office Hours: Tuesday & Thursday by appointment

Phone: (303) 254-3403 (office, 8:00 am – 5:00 pm)

Email: jselman@tristategt.org (office) Jeff_Selman@yahoo.com (home)

Course Prerequisites: EE 2142 (Circuits II)

Grading:

Exam I: 25%

Exam II: 25%

Exam III: 25%

Quizzes: 15%

Homework: 10%

Reading Assignments:

1. **Chapter 1:** 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9
2. **Chapter 2:** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6
3. **Chapter 3:** 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.9, 3.10
4. **Chapter 8:** 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.10, 8.11, 8.13, 8.14
5. **Chapter 5:** 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.12, 5.13, 5.14
6. **Chapter 7:** 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.8, 7.9, 7.10, 7.11

1. Homework assignments will be due 1 week from the day assigned unless otherwise announced in class. Homework assignments will normally not be accepted after the due date. All homework assignments must be completed on Engineer's Computational Pad paper as specified in the Homework Standard.

2. Exams will be in-class, 75 minutes, closed book, closed notes. A single 8.5x11 inch sheet of paper (two sides) with equations will be allowed during the exams and will be handed in with each exam. Make-up of exams will only be permitted if prior arrangements are made, at the discretion of the instructor, or in the case of medical emergency, notification is made by email or phone no later than the day of the exam. In the case of medical emergency, a written doctor's excuse may be required.

3. Students should keep the university updated with any email address changes since notification of any class cancellations will be by email.

4. **Student Conduct:** Students caught cheating on exams or quizzes or copying other's homework assignments will be subject to disciplinary action per the College of Engineering and Applied Science Committee on Discipline. The form used to adjudicate these matters is available either from Helen Frey in the E.E. office or Paul Rakowski in the Dean's office. Students are expected to attend class on a regular basis, be on time, and conduct themselves in a professional manner. Any students causing disruption in the classroom will be asked to leave the class.

5. **Students Called for Military Duty:** If you are a student in the military with the potential of being called to military service and/or training during the course of the semester, you are encouraged to contact Paul Rakowski.

6. **Students with Disabilities:** Students with disabilities are encouraged to contact Helen Frey in the E.E. office or Paul Rakowski in the Dean's office.