

NEW YORK CITY COLLEGE OF TECHNOLOGY
The City University of New York

DEPARTMENT: Electrical and Telecommunications Engineering
Technology

**SUBJECT CODE
AND TITLE:** EET2150/ET322- Electric Machines Theory

COURSE DESCRIPTION: Principles and characteristics of DC and AC machines.
Topics include : DC generators and motors, construction characteristics and ratings, alternators, transformers, polyphase induction motors, single-phase motors and synchronous motors.

PREREQUISITES: EET1222/ET242, PHYS1433/SC433

TEXTBOOK: Direct and Alternating Current Machinery
By Rosenblatt and Friedman, Second Edition

**COURSE OBJECTIVES/
COURSE OUTCOMES:** Upon completion of this course the student will possess a working knowledge of the operation and construction of the following:

1. DC motors and generators. (ABET Criteria 2a, 2b, 2d, 2f, 2h, 2i)
2. AC Motors and Alternators. (ABET Criteria 2a, 2b, 2d, 2f, 2h, 2i)
3. Single and three phase transformers. (ABET Criteria 2a, 2b, 2d, 2f, 2h, 2i).
4. The safe generation and distribution of power. (ABET Criteria 2a, 2b, 2d, 2f, 2h, 2i)

TOPICS Topics include the relationships between the magnetic field/ electrical generation/ mechanical motion in the modern electrical system.

CLASS HOURS: 3

CREDITS: 3

PREPARED BY: Professor John Fehling, PE
November, 2006
e-mail: Jfehling@citytech.cuny.edu

**COURSE
COORDINATOR** Professor A. Goykadosh
(718) 260-5310
e-mail: AGoykadosh@citytech.cuny.edu

GRADING POLICY: ET322

Exam 1	33.3 %
Exam 2	33.3 %
Final Examination	33.3%

<u>Letter Grade</u>	<u>Numerical Grade Ranges</u>	<u>Quality Points</u>
A	93-100	4.0
A-	90-92.9	3.7
B+	87-89.9	3.3
B	83-86.9	3.0
B-	80-82.9	2.7
C+	77-79.9	2.3
C	70-76.9	2.0
D	60-69.9	1.0
F	59.9 and below	0.0

WEEK	TOPIC	READING ASSIGNMENT	HOMEWORK PROBLEMS
1	The IEEE Code of ETHICS. Safety considerations including OSHA considerations, when designing and using electrical Machinery. Types of rotating machinery. Armature and field winding construction of dc and ac generators. Characteristics of dc and ac generators. Unit conversions	Handout Chapter 1 Pages 1-4 Chapter 3 Pages 21-25	
2	Electromagnetic induction Faraday's Law, Right Hand Rule Commutation	Chapter 2 Pages 5-18	2-4, 2-9, 2-11, 2-14
3-4	DC generator characteristics. The voltage builds up process. Critical resistance calculations. The series dc generator. The shunt dc generator. Compound generators. Voltage regulation calculations. Armature reaction. Exam 1	Chapter 5 Pages 44-60	5-7, 5-12, 5-14, 5-16
5-6	DC motor characteristics Force and torque developed by motors. Counter EMF of a motor. Starting a motor. The series dc motor. The shunt dc motor. Compound dc motors. Efficiency calculations. Speed regulation	Chapter 8 Pages 89-106	8.4-8.8, 8.11-8.18
7	Midterm Exam		
8	Single phase transformers. Transformer fundamentals and construction. Voltage and current ratios of an ideal transformer. Efficiency of an ideal transformer. Impedance reflections and equivalent circuits. Name plate data.	Chapter 14 Pages 175-185 Chapter 16 Pages 237-260	15.8-15.10 16.1-16.5
9	Non ideal transformers. Equivalent circuits Short circuit test. Transformer voltage regulation and transformer efficiency calculations	Chapter 14 Pages 186-210	14.22-14:24 14.27, 14.28, 14.29
10-12	Multiple secondary winding single phase transformers. Auto transformers., Three phase transformers Wye to Wye Delta to Delta, Delta to Wye Exam III	Chapter 15 Pages 217-226 Chapter 16 Pages 237-260	15.8-15.10 16.1-16.5
13-14	AC motors and alternators Single phase motors Series motor. Inductor motor Three phase motors. Induction motor Principles of operation. Torque measurements. Slip calculations. Equivalent circuits. Efficiency calculations	Chapter 22 Pages 4876-498 Chapter 17 Pages 265-315	17.9-17.14 17.16-17-18 17.20-17.21 17.25-17.25 17.35-17.36
15	Final Examination		