Tel Aviv University
Faculty of Engineering
School of Electrical Engineering

אוניברסיטת תל אביב
הפקולטה להנדסה
בית הספר להנדסת חשמל

Energy Conversion

0595.3571

Fall Semester

LECTURER **Doron Shmilovitz**

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INSTRUCTOR **Liran Katzir**

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COURSE TOPICS

Week 1: Power and energy definitions and interpretation in the context of power systems, phasor representation, Basics of nonlinear loads and harmonics.

Week 2-4: Magnetic circuits: Linear and non-linear magnetic circuits in direct and alternating currents, hysteresis and eddy current losses, flux leakage, magnetically coupled circuits

Week 5: Three-Phase power system: voltages, currents, power in symmetric networks, phasor diagrams

Week 6-7: Transformer: Single and three-phase transformer structure, equivalent circuit, losses, efficiency, no-load and short circuit tests, voltage regulation.

Week 8-9: Direct Current Machines: structure, operation principle and equivalent scheme. Generators and motors in separate, shunt, series and compound excitations, e.m.f., torque, power, losses, efficiency, generator load characteristics, motor mechanical characteristics, motor speed regulation.

Week 10: Photovoltaic Energy Systems: Solar cell *i-v* characteristics, series and parallel connections, photovoltaic arrays, maximum power point tracker.

Week 11-13: Induction Machine: Structure, rotating magnetic field, equivalent circuit, powers, losses, efficiency, speed-torque characteristics, starting, speed regulation.
As time allows: Basics of dc-dc converters in steady state.

ASSIGNMENTS

At least 80% of all homework assignments must be handed in for evaluation. Homework will count for 15% of the total course grade.

MIDTERM COURSE POLICY

A midterm exam will be scheduled at the beginning of the semester. During the examination, student shall not use books, papers, or other materials not authorized by the instructor. The midterm will count for 15% of the total course grade.

FINAL COURSE POLICY

The final exam will cover the entire course material and will count for 70% of the total course grade. There will be no choice of questions. The exam duration will be 3 hours. During an examination, students are permitted to use any printed materials. Students will have a first exam, Moed A. Student who do not pass, can retake the exam, Moed B. The last exam taken will be the student's final grade for the exam.

REQUIRED READING

1. Del Toro, *Electromechanical devices for Energy conversion and Control Systems* , Prentice-Hall
2. S. J. Chapman, *Electric Machinery Fundamentals* McGraw-Hill Inc.
3. R. W. Erickson, *Fundamentals of Power Electronics*, 1st and 2nd editions.
4. Additional reading material will be distributed by the instructor.