



Course Name	EE 432 - Industrial Electronics
Course Web Page	www.denizyildirim.org/ee432
Course Schedule	Monday: 11:00 - 13:00
Office Hours	Monday: 13:00 - 14:00
Instructor	Room: Industrial Electronics Laboratory Asst. Prof. Deniz Yildirim Tel : 0212 285 6744 E-mail : deniz@ieee.org
Teaching Assistants	Oben Dag Tel : 0216 578 0472 E-mail : obendag@yeditepe.edu.tr Room : B 647
Textbook	Thomas E. Kissell, <i>Industrial Electronics: Applications for Programmable Controllers, Instrumentation and Process Control, and Electrical Machines and Motor Controls</i> , 3rd. ed., Prentice Hall, 2002.
Supplementary Materials	Laboratory Experiment Handouts
Midterm Exam Date	March 29, 2010 Monday 11:00-13:00 in class (open notes/open books)
Grading	Laboratory work : 20% Term Project : 25%, 5% (20/100) given for check date performance. Midterm Exam : 15% Final Exam : 40%
Term Project	<i>Public Bus Signaling System.</i> <ul style="list-style-type: none">▪ Group project up to three students,▪ You will be <u>designing, constructing and testing</u> the signaling system of a public bus.▪ Prepare term project report, must include cover page given in web page (<i><u>otherwise 50% grade penalty</u></i>).▪ Check date: April 19, 2010 at 12:10pm▪ Due date: May 10, 2010 at 11:00am - submit your report and circuit in Industrial Electronics Laboratory▪ Best working project that satisfies specifications will receive 20% additional grade.
Attendance	Attendance to lectures and laboratory sessions are required.



**Weekly Course
Outline
(tentative)**

1. Introduction and outline of the course, definition of industrial electronic systems, solid-state devices used to control power: thyristor, triac, power transistor, power mosfet, IGBT, operation principles, voltage-current characteristics, and comparison of power semiconductors. Solid-state devices used for firing circuits.
2. Industrial power supplies: single- and three-phase rectifiers, inductive and capacitive filtering requirements.
3. AC-AC converters for power control in AC circuits: single- and three-phase AC choppers, phase-control and integral-cycle control techniques.
4. DC-DC converters: Linear vs. switching power supplies, buck, boost and buck-boost converters, isolated flyback, forward, half/full bridge converters.
5. Inverters: single- and three-phase square wave inverters, pulse-width-modulation (PWM) control technique.
6. Programmable Logic Controllers (PLC): parts of a PLC, timing and counting, relay logic, ladder logic diagram, PLC programming.
7. PLC continued.
8. Application of operational amplifiers: instrumentation amplifiers, hysteresis comparators, integrators, differentiators, and signal generators.
9. Application of operational amplifiers: continued.
10. Open- and closed-loop feedback systems: proportional, integral, and derivative controllers, realization with operational amplifiers, controller tuning (Ziegler-Nichols).
11. Input Devices: Sensors, transducers, and transmitters, temperature, pressure, flow, level, position, speed, motion sensors.
12. Input devices continued.
13. Output devices: valves, relays, contactors, variable frequency drives, DC drives.
14. Output devices continued.

**Laboratory
Experiments**

1. Single-phase full-wave bridge rectifier and linear regulator.
2. Power control in AC circuits using an AC chopper.
3. Switched-mode DC-DC conversion using buck and boost converters.
4. Controlling a squirrel-cage induction motor with Simatic S7-300 PLC.
5. Closed-loop temperature control of an electrical oven.
6. Speed control in a DC drive system employing a three-phase controlled rectifier.

Prepare group report for each experiment. Reports must obey the sample report document format given in web page (*otherwise zero grade from the report*).

**Additional
Remarks**

Please periodically check course web page for additional information.