



# University of Management & Technology

School of Science & Technology

Department of Electrical Engineering

## EE 455 Industrial Electronics

<b>Lecture Schedule</b>	As per timetable	<b>Semester</b>	Spring 2013
<b>Pre-requisite</b>	EE 447 - Power Electronics	<b>Credit Hours</b>	3
<b>Instructor(s)</b>	Asif Hussain <sup>[1]</sup> (Sec C) Nauman Ahmad <sup>[2]</sup> (Sec A) Tabraiz Ahmed Alvi <sup>[3]</sup> (Sec D)	<b>Contact</b>	<a href="mailto:asif.hussain@umt.edu.pk">asif.hussain@umt.edu.pk</a> <a href="mailto:nauman.ahmad@umt.edu.pk">nauman.ahmad@umt.edu.pk</a> <a href="mailto:tabraiz.alvi@umt.edu.pk">tabraiz.alvi@umt.edu.pk</a>
<b>Office</b>	3S-33, Room # 12 <sup>[1]</sup> C1-16 <sup>[2]</sup> Control Systems Lab. <sup>[3]</sup>	<b>Office Hours</b>	Posted on respective office doors
<b>Course Description</b>	Electric heating: Principles and applications; induction and dielectric heating; high-frequency welding. Spot welding control. Industrial control: Speed control of DC, AC, and servo motors. Process control. Measurement of non-electrical quantities: Temperature, displacement, pressure, time, frequency; digital industrial measuring systems. Ultrasonic generation and applications. X-ray applications in industry. Photo-electric devices. Industrial control using PLCs. Data acquisition. Distributed control system in process industries. The course directly contributes to <b>objectives</b> a, d, e and f of the HEC Electrical Engineering Curriculum.		
<b>Expected Outcomes</b>	The course strongly supports expected <b>outcomes</b> a, b, d and i of the HEC Electrical Engineering Curriculum. Upon completion of this course, students will understand various industrial applications of electronics including heating, welding, speed control of electrical machines, photo-electric devices, PID controllers, PLCs, and data acquisition.		
<b>Textbook(s)</b>	<p><b>Recommended Text:</b></p> <p>[1] "Industrial Electronics, Devices and Systems" by Dale R Patrick and Stephen W Fardo, The Fairmont Press, Inc., 2000</p> <p>[2] "Power Electronics" by M D Singh and K B Khanchandani, 2<sup>nd</sup> Edition, Tata McGraw-Hill</p> <p><b>Reference:</b></p> <p>[1] "Programmable Logic Controllers," by Frank D. Petruzella, 3<sup>rd</sup> Edition, 2005, McGraw-Hill</p> <p>[2] "Industrial Electronics," by Frank D. Petruzella, 1<sup>st</sup> Edition, 1995, McGraw-Hill</p> <p>[3] "Power Electronics: Circuits, Devices And Applications" by M. H. Rashid, 3<sup>rd</sup> Edition, 2001</p>		
<b>Grading Policy</b>	<ul style="list-style-type: none"> <li>▪ Assignments: 10 marks</li> <li>▪ Quizzes: 15 marks (All quizzes will be mandatory and announced. Quizzes will be of 10-15 minutes duration.</li> <li>▪ Midterm: 25 marks (60-70 minute exam. All topics covered before the midterm exam will be included)</li> <li>▪ Final: 50 marks (120-150 minute exam. will be comprehensive)</li> </ul>		

## Course Schedule

Lecture	Topics	Textbook (TB) /RB Reference (Ref) Book
1-2	Review of basics of Power Electronics	RB[3]:
3 – 6	Control of D.C. Drives: Basic machine equation, Scheme for D.C. motor speed control, Single phase separately excited drives, Single phase series D.C. motor drives, Three phase separately excited drives, D.C. chopper drives	TB[2]: Ch. # 14 [14.1 – 14.8]
7 – 10	Electric Heating, Welding, Resistance welding and its types , Arc Welding and its types	Notes
11 – 14	Process Control, Control Variables , Control systems and its Types, Feed forward, feedback Systems, applications, ON-OFF Controller, PID Controller ,applications	TB[1]: Ch. 12
15-16	<b>MID TERM EXAM 8<sup>TH</sup> WEEK</b>	<b>All Covered Course</b>
17 – 20	Transducers and sensors , Active and passive transducers , their types and applications in the industry	TB[1]: Ch. # 07
21-24	Photoelectric Devices and optoelectronic devices, photo-diodes, Pin-Diodes, photo transistors, photo-FETS, opto-couplers etc and their applications.	TB[1]: Ch. # 8
25 – 26	Industrial control using PLCs , Basics, relay logics ,Ladder logics, sensors ,normally open and normally closed contacts, motor starter circuits , applications	Notes
27 – 30	Control of A.C. Drives: Basic principle of operation, Speed control of induction motor, Stator voltage control, Variable frequency control, Rotor resistance control, Slip power recovery scheme, Synchronous motor drives	TB[2]: Ch. # 15
	<b>Final Term Exam (Comprehensive)</b>	