15MH319E	Industrial Electronics			L	T	P	C
				3	0	0	3
Co-requisite:	Nil						
Prerequisite:	Nil						
Data Book / Codes/Standards	Nil						
Course Category	P	Professional Elective	Electrical Engineering				
Course designed by	Department of Mechatronics Engineering						
Approval	32nd Academic Council Meeting held on 23.07.2016.						

Purpose	To impart knowledge of electronic devices for conversion, control and conditioning of electric power in industrial environment.							
Instructional Objectives		**Student Outcomes**						
At the end of the course, student will be able to								
1.	Improve their ability to understand the need of electronics devices as regulators and power supplies and their applications.	a						
2.	Apply the advanced controls to improve their knowledge in understanding the concept of heating and welding.	a	c					
3.	Explore themselves familiar with functions of several industrial motor controls.	a	c					
4.	Determine the industrial application of power switching devices.	a	c					
5.	Investigate the concept of AC power conditioner.	a	c					

Session	Description of Topics	Contact hours	C-D-I-O	IOs	Reference
	Unit I: Introduction to Regulators and Power Supplies	**10**			
1.	Concept of regulation, block diagram of a regulated power supply, significance of regulated power supply.	1	C	1,4	1,3
2.	Performance parameters: Major specifications of a regulated power supply, line and load regulation, output ripple and transients.	1	C,D	1	1,3
3.	Principles of series regulators: Types.	2	C,D	1	1,3
4.	Principles of shunt regulators: Types, concepts of foldback limiting, short circuit and overload protection.	1	C,D	1	1,3
5.	Three terminal voltage regulator ICs:Positive, negative and variable applications.	1	C,D	1	1,3
6.	Switched Mode Power Supply: Basic working principles, applications, advantages and disadvantages.	1	C,D	1	1,3
7.	Concept of floating and grounded power supplies and their interconnections to obtain multiple output supplies.	1	C,D	1	1,3
8.	Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter, cuk converter.	2	C,D	1,4,5	1,3
	Unit II: Heating and Welding Control	**8**			
9.	Electronic control of heating: Resistance heating, induction heating, principle.	1	C	2	1,2
10.	Electronic control of heating: effects of supply frequency and source voltage, choice of frequency, advantages and applications.	1	C	2	1,2
11.	High frequency induction heating: Types, electronic heaters employed for induction heating.	2	C,D	2	1,3
12.	Thyristorised supplies used in induction furnaces, dielectric heating.	1	C,D	2	1,3
13.	Electronic control of welding, electric welding, classification of resistance welding.	1	C,D	2	1,3
14.	Control circuit for resistance welding, AC resistance heating.	2	C,D	2	1,3
	Unit III: Industrial Motor Control	**10**			
15.	Method of controlling speed, basic control circuit: DC motor control, speed control of DC motors.	2	C,D	3	2,5
16.	Speed control of small DC motors.	1	C,D	3	2,5
17.	Solid state motor control: Speed control of DC shunt	1	C,D	3	2,5

Session	Description of Topics	Contact hours	C-D-I-O	IOs	Reference
	motor using thyristor technology.				
18.	PLL control of a DC motor control, Over-voltage protection and over load protection of DC motors.	1	C,D	3	2,8
19.	AC motor control: Speed control of three phase induction motor, speed control of single phase induction motor.	2	C,D	3	2,8
20.	Triac as a starter for single phase induction motors and universal series motor.	1	C,D	3,4	1,2
21.	Applications of AC line voltage controllers, zero voltage switching, synchronous tap changer, AC power control of a lamp dimmer circuit.	2	C,D	3,4	1,3
	Unit IV: Industrial Application of Power Switching Devices	**8**			
22.	Principle of operation and working of automatic battery charger using SCR, emergency light using SCR.	2	C,D	4	1,3
23.	Time delay relay circuit, automatic temperature control circuit, types.	2	C,D	4	1,3
24.	Battery operated inverter circuit using power transistor, illumination control using SCR, DIAC and TRIAC.	2	C,D	4	1,3
25.	Electronic timers: Sequential timer, digital timer, electronic time delay circuits.	2	C,D	4	1,3
	Unit V: AC Power Conditioner	**5**			
26.	Power supply noise, different forms of noise.	1	C	5	3,4
27.	Servo system: Servo motor, principle of buck-boost control of a servo controlled voltage stabilizer.	1	C	5	3,4
28.	Servo-controlled voltage stabilizer, ferro-resonant AC regulator- Synchro: Constructional features and principle of operation.	2	C	5	3
29.	UPS - Online and Offline UPS, principle of operation of choppers, step up, step down and reversible choppers.	1	C	5	3,4
	Assessment	**4**			
30.	Cycle test – I	1			
31.	Cycle test – II	2			
32.	Surprise test / Assignment and Quiz	1			
	Total contact hours	**45**			

Learning Resources	
Sl. No.	**Text Books**
1.	S. Bhattacharya, S. Chatterjee, "*Industrial Electronics and Control*", Tata McGraw Hill, 2006.
2.	Dubey, G.K., Doradia. S.R., Joshi.A. and Singh.R.M., "*Thyristorised Power Controllers*", Wiley Eastern Limited, 2008.
3.	Biswanath Paul, "*Industrial Electronics and Control*", Prentice Hall India publisher - 2004.
4.	Chitode .J.S, " *Industrial Electronics*", Technical Publications , 2009.
	Reference Books / Other Reading Materials
5.	M. H. Rashid, "*Power Electronics Circuits, Devices and Application*", Prentice Hall of India, 3rd edition, 2004.
6.	G. K. Mithal, "*Industrial and Power Electronics*", Khanna Publishers, Delhi, 2000.
7.	Terry Baltelt, "*Industrial Electronics, Devices, Systems and Applications*", Delmar publishers, 2006.
8.	Stephan L.Herman, Walter N.Alerich, "*Industrial Motor Control*", 4th edition, Delmar publishers, 2010.

Course nature				**Theory**			
Assessment Method (Weightage 100%)							
In-semester	**Assessment tool**	Cycle test I	Cycle test II	Cycle Test III	Surprise Test	Quiz	**Total**
	Weightage	**10%**	**15%**	**15%**	**5%**	**5%**	**50%**
End semester examination Weightage:							**50%**