

1	Name of Course	CC in Inverter, UPS, Voltage Stabilizers and Industrial Driv ( 301122 )																																									
2	Max.Nos. of Student	25 Students																																									
3	Duration	6 Months																																									
4	Type	Full Time																																									
5	Nos Of Days / Week	6 Days																																									
6	Nos Of Hours /Days	7 Hrs																																									
7	Space Required	Laboratory = 1000 Sq feet Class Room = 200 Sq feet <b>TOTAL = 1200 Sq feet</b>																																									
8	Entry Qualification	<b>S.S.C. + Any Course of Electronics Group of MSBVE</b>																																									
9	Objective Of Syllabus/ introduction	Awareness of Safety precautions. Knowledge of soldering techniques, Testing, use of tools in assembly Application of Electronic / Electrical components used in Inverter, UPS, Voltage Stabilizers and Industrial Drives. Ability to read schematic layouts wrings diagrams. Repair & Maintenance of Inverter, UPS, Voltage Stabilizers and Industrial Drives.																																									
10	Employment Opportunity	The trainee will either to be able to take up jobs with agencies which maintain and repair such equipments or with working experience wi in a position to start his own independent Business.																																									
11	Teacher’s Qualification	Diploma in Industrial Electronics Engineering.																																									
12	Training System	Training System Per Week <table><tr><td><b>Theory</b></td><td><b>Practical</b></td><td><b>Total</b></td></tr><tr><td>12 Hours</td><td>30 Hours</td><td>42 Hours</td></tr></table>							<b>Theory</b>	<b>Practical</b>	<b>Total</b>	12 Hours	30 Hours	42 Hours																													
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13	Exam. System	<table><tr><td>Sr. No.</td><td>Paper Code</td><td>Name of Subject</td><td>TH/PR</td><td>Hours</td><td>Max. Marks</td><td>Min. Marks</td></tr><tr><td>1</td><td>30112211</td><td>Inverter, UPS, Voltage Stabilizers and Industrial Drives</td><td>TH-I</td><td>3 hrs</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30112221</td><td>Basic Electronics &amp; Assembly Technique</td><td>PR-I</td><td>3 hrs</td><td>100</td><td>50</td></tr><tr><td>3</td><td>30112222</td><td>Inverter, UPS, Voltage Stabilizers and Industrial Drives</td><td>PR-II</td><td>6 hrs</td><td>200</td><td>100</td></tr><tr><td></td><td></td><td><b>TOTAL</b></td><td></td><td></td><td><b>400</b></td><td><b>185</b></td></tr></table>							Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks	1	30112211	Inverter, UPS, Voltage Stabilizers and Industrial Drives	TH-I	3 hrs	100	35	2	30112221	Basic Electronics & Assembly Technique	PR-I	3 hrs	100	50	3	30112222	Inverter, UPS, Voltage Stabilizers and Industrial Drives	PR-II	6 hrs	200	100			<b>TOTAL</b>			<b>400</b>	<b>185</b>
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# **SYLLABUS**

## **Inverters, UPS ,Voltage stabilizers and Industrial drives**

<b>Practical - II</b>	<b>Theory - I</b>
Familiarise with various types of wires and cables Exercises on High Wattage resistors, Capacitors , various types of Inductors.	Review on Wires and Cables, their types, Voltage and current rating, selection of cables for various applications , passive components-Resistor, Capacitors & Inductors,
Identify the terminals and rating of various types of switches and protective devices.	Review of Electrical circuits,Faraday's law of electromagnetic induction, Lenz's law, Fleming's right hand & left hand rule,Various controlling and protective devices - Switches, main switches, Fuse, MCB, ELCB, relays and S S Relays etc,
Understand the wiring circuits and protective devices used in domestic and industrial wiring . Earth resistance measurement. Familiarize with various types of batteries, grouping of batteries, connectors used with batteries. Assemble and test the various battery charging circuit	Electrical wiring for Single phase and Three phase systems, Earthing and earth resistance measurement, calculation of load ,power and power factor Review on Batteries - various types, their selection, grouping of cells and batteries, charging of batteries,Various Battery charging circuits used in Inverters and UPS , Maintenance of Batteries
Identify and test the types of transformers. OC and SC test of Transformers. Method to find the winding sequence of the transformer.	Transformers - their types, core materials, ferrite core transformers, Magnetic Hysteresis , various losses of transformers, Efficiency of Transformers,3 phase transformers, Star / Delta connections, OC & SC test of Transformers, Factors affecting the functions of transformers, Selection of Tx for Inverter,UPS,Automatic & servo Voltage stabilizers
Testing of Power Diodes and Power transistors. Familiarise with various packages of diodes and Transistors. Identification and selection of Heat sinks for various applications. Assemble and test the high current rectifier circuits, measure various parameters, find out the simulated fault and rectify	Diode, Power diodes -capacitance of diode, low frequency and high frequency applications, Rectifiers, 3 phase rectifiers, Switching action,period and power rating of transistors, low frequency and high frequency transistors, Heat sinks - their types, ratings and their cooling systems, Review of Power supply,filter circuits, ripple factor, High current rectifier circuits, precaution and handling of rectifier circuits,
Testing methods used for MOSFET, IGBT. Familiarise with various packs of MOSFET and IGBT, wire up a circuit and test MOSFET/IWE working as switch. Construct, half and full converters using SCR, measure various	Power MOSFET, IGBT - their types, characteristics, switching speed, power ratings and protection. SCR-SCR as rectifier,Power ratings of SCR,Half and full wave ckts of SCR,3 phase rectifiers,SCR Protection circuits,Power control using SCR
parameters, construct a half converter circuit used s battery charger.	

Assemble ,test the oscillators & wave shaping. Assemble and test various oscillator circuits used in inverters. Construct a PWM circuit using MOSFET for DC power control and measure various parameters. Construct the electronic control circuit used in servo controlled stabilizers using temp. ICs, TRIAC, adjust the circuit for low and high voltage, over current cut-off.	Oscillators and wave shaping circuits: classification , Different 50 Hz oscillator circuits, oscillator circuits used in Inverters, Sinewave generation using PWM techniques. Manual & automatic and servo voltage stabilizers- concept and block diagram, o/p voltage adjustment, voltage cutoff systems, study of different types of relays used in stabilizers, study of electronic circuit commonly used, buck and boost concept
Construct and test Inverters of various power ratings Installation of inverters,Test the various protection circuits used in Inverters,fault finding in inverters.	Inverter - their principle & operation, power rating, change over period. Installation of Inverters, Protection circuits used in inverters- battery level, over load, over charging etc.Various faults and its rectification
Testing and Installation of Three phase Inverters	Three phase inverter circuits - principle and working.
Execution of program instruction using Controller kit	Microcontroller PLC 8051:Architecture,programming,instruction set
Assemble and test low power Off-line UPS circuits. Selection of UPS	Concept of UPS, OFF LINE and ONLINE . Difference between Inverters and UPS. Low power Off line UPS circuits. Selection of UPS -calculation of load power,Line interactive UPS
Familiarise with the various types of ON-LINE UPS and their circuits. Fault finding in UPS.	ON- Line UPS, their circuit description and working- controlling circuits, Micro controller circuits, power circuits, charging circuits, alarm circuits, Indicator circuits
3 phase UPS Circuits, Installation of single phase &3 phase UPS.	Three phase UPS Circuits,Installation of single phase and 3 phase UPS.
Understand all the information on a Motor template Connect and run the DC Shunt motors, Speed control of DC shunt motor.	DC Motors- types, working ,torque speed characteristics,staring of DC Motors & change the DOR, 3 point and 4 point Starters,speed control of DC motor, Field flux control & armature current control. Brushless DC Motors.
Connect and run the 3 phase induction motor, Familiarise with the DOL, Star/delta and Transformer type starter	Fundamentals of 3 phase & single phase Induction motors, synchronous speed, slip, rotor frequency , torque - speed characteristics, Starters used for Induction motors, speed control of Induction motors
Construct and control PWM circuit for the speed control of DC motors	DC drives-their principle and working, open loop speed control system
Study & observe the O/P of various speed sensing Circuits	Closed loop speed control system,speed sensing devices& circuits,Hall sensor,Opto couplers,Magnetic sensors,tacho generators,Back emf system
Study constructional details & test the closed loop control DC drive, identify and rectify them simulated parts in DC motor. Study the load characteristics of 3 phase induction motor.	Closed loop control of DC shunt motor using various methods,rotating M/C load characteristics,Introduction to harmonics, Closed loop speed control method for 3 phase induction motor, VF
Connect and test the VF drives. Connect VFD with various control, programming device	method, rectifiers and filters used in VFD, Prog parameters sequence and programming of VFD
Connect the drives with PLC and test for various application.	Block diagram of basic PLCSystem ,Different types of I/P & O/P,PLC Programming,Instruction set. Connection of drive with PLC and control

## Basic Electronics & Assembly Technique

Practical - I
Tool Identification, safety precautions, Familiarization with Electronic Components. Different Type of Soldering Iron. Use of Soldering Iron. Color Code of Fixed Resistors.
Use of various Meters for Measuring Voltage, Current , Resistance etc. Safe Handling of Instruments . Use of Digital & Analog Multimeter. Familiarization with CRO. Measurement of L, C and R using LCR bridge.
Identification & Testing of various types of Diodes. Familiarization with CRO, Operating knobs. Construction of Half Wave & Full Wave Rectifiers. Calculation of Ripple using Filters to improve DC Output
Transistor Testing, study the transistor characteristics. Construction of single stage amplifier. Construction of a transistor- switch and to drive a relay.
Construction of RC Phase Shift Oscillator. Construction of Astable and Bistable multivibrator.
Plotting of V-I Characteristics of SCR/Triac, study of light Dimmer.
Lab Demonstration of all types of Digital Logic Gates. Verification of all truth table. Familiarization with various IC and their Packages.

Sr.No.	Description of Items	Qty
1	Crimping tool set	4
2	Spanner set DE, Ring	2
3	Screw drivers assorted size	2 each
4	Soldering Iron 65w	2
5	Neon Testers, 500V	2
6	Combination Plier	4
7	Loose Nose plier	4
8	Diagonal cutter	4
9	Neon Tester	10
10	Screw driver set	10
11	Electrician Knife	10
12	Allen key set	4
13	Steel rule	4
14	Hammer	4
15	Mallet	4
16	Hand Shear metal cutting 25 cm	4
17	Electric drilling machine portable 10mm	4
18	File flat 200mm 2 <sup>nd</sup> cut	4
19	Tri square	4
20	Instrument file set	4
21	Bench vice 200mm	6
22	Inverters 500VA with suitable batteries	4
23	Inverter 1KVA, 3KVA with suitable batteries	1 each

24	OFF - LINE UPS 500VA, 1KVA, 3 KVA	1 each
25	ON-LINE UPS 5 KVA	1 each
26	Inverter 3 phase 3 KVA	1
27	ON-LINE UPS, 3 phase, 3 KVA	1
28	Clip on Meter - digital	2
29	Power supplies 0-30V, 5A	2
30	Multimeter 20Meg, 20 Amps AC/DC	4
31	Watt meter 10A	1
32	Earth Megger	2
33	Multimeter Digital	
34	Dual power supply 0-30V, 2A	1
35	CRO, 50 MHz, Dual Trace	2
36	Function Generator	2
37	Battery charger	2
38	Line Interactive UPS	1
39	Discharge Tester	2
40	1 KVA & 2 KVA automatic Voltage Stabilizers	1 each
41	1KVA,2 KVA & 5 KVA Servo Controlled Voltage stabilizers.	1 each
42	Servo Stabilizer Trainer	1
43	Basic Electronics Trainer	2
44	Power Electronics Trainer	2
45	Microcontroller Kit along with add on cards DAC,ADC,Stepper Motor	4
46	DC shunt motor 5 HP,1500 rpm	1
47	DC Compound motor 5HP,1500 rpm	1
48	AC 3 phase Induction motor,7.5 HP Squirrel cage	1
49	AC 3 phase slip ring Induction motor	1
50	3 Pt & 4 Pt starter	2 each
51	Brushless DC Motor	1
52	Universal motor	2
53	Single phase Transformer, 3 Phase transformer	2
54	DC drive/ Trainer using phase control, PWM	1 Each
55	Variable Frequency Drive/Trainer	1 No.
56	Trainers of various sensors -Hall sensor ,Magnetic sensor,tacho generator,Opto-couplerwith complete set up	1
57	PLC system	1
58	Open loop & Close loop speed Control Trainers for AC motor and test setup compatible with PLC system	1

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