

# CALICUT UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY

No.41173/CUIET-A-ASST-1/2013/CU

Dated:26.10.2016

## TENDER NOTICE

Sealed competitive tenders are invited for the supply of the following Lab items to the Electrical and Electronics Engineering Department of CUIET. The tender forms can be downloaded from the University website. The bidders should remit 0.2% of the cost of tender as tender cost rounded to the nearest multiple of 100, subject to a minimum of Rs.400/-+VAT @5% and maximum of Rs.1,500/-+VAT @ 5%(as DD in favour of Finance Officer, University of Calicut). EMD (1% of quoted rate subject to a minimum of Rs.1,500-) drawn in favour of Finance Officer should also be submitted. The rate quoted should be inclusive of all taxes and all other charges.

**Sealed and superscribed tenders should reach the undersigned on or before 15/11/2016.**

### LIST OF ITEMS FOR ELECTRICAL MEASUREMENTS LAB

Sl. no	Materials	Specification	Quantity
1	Voltmeter	(0-250)V MI	5 no
2	Ammeter	(0-2)A MI	2 no
3	Ammeter	(0-2)A MC	5 no
4	Rheostat	50 $\Omega$ , 5A 250 $\Omega$ , 1.6A	5 no 3 no
5	DC source	(15-300)V, 3A	2 no
6	Watt meter	500V/250/150, 30A UPF	3 no
7	Clip on meter(analog)	Up to 30 A	1 no
8	Multimeter(analog) Heavy Duty	(Unfused 20A max 10 sec each 15 min Fused 200mA MAX 500V DC/AC RMS Protection in resistance range 1000v DC, 750 AC MAX)	1no
9	Decade resistance Box	6 knob 1ohm, 10ohm, 100ohm, 1k, 10k, 100k	1 no
10	Loading rheostat	Three phase 5.1KW, 440V, 50Hz load per step/phase	1no

### LIST OF ITEMS FOR POWER ELECTRONICS LAB

Sl. No	Name	Specification	No of Units required
1	CRO	<b>Cathode-Ray Oscilloscope</b> 25MHz , 2 channel, 4 trace microcontroller based, <b>Note: demonstration necessary</b>	1
2	Digital storage oscilloscope	<b>Digital Storage Oscilloscope</b> 50 MHz digital storage oscilloscope with differential probe dual channel; color, real time sampling:1GSa/s,memory:1 M Points, Display analog along with USB & RS232 Port &software, altertate trigger, circuit test facility, read and write USB memory, harmonic analysis	1
3	Analog Meter	Voltmeter (0-30) MC	4
4		Voltmeter (0-30) MI	4
5		Ammeter (0-10) mA MC	4
6		Ammeter (0-10)mA MI	4
7		Analog multimeter (heavy duty)	6
8		<b>Center tapped Transformer</b> 230V/(12-0-12),2A,Heavy Duty	4
9	Trainer kit for characteristics of SCR (Aim: To plot static & dynamic characteristics of SCR)	<b>SCR CHARACTERISTICS STUDY</b> <b>TRAINER</b> * Basic static characteristics study trainer. * Variable DC power supply ( <u>Suitable value</u> ) for SCR $V_{ak}$ . * Variable DC power supply ( <u>Suitable value</u> ) for gate voltage of all devices. * Separate section for SCR characteristics. * Two No's fixed load resistor for all devices. * Four No's potentiometer to vary all voltages. * LED indication for all power supply. * Three No's. Digital multimeter for measurement of device parameters. * 230V AC input with Power ON/OFF switch. * Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc., <b>SUGGESTED EXPERIMENTS :</b>	1



		<p>1. To plot static characteristics of SCR</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p><b>Note: demonstration necessary</b></p>	1
10	Trainer kit for dynamic characteristics of SCR	<p><b><u>TRANSIENT CHARACTERISTICS OF SCR</u></b></p> <p>a). Transient Characteristics of SCR :</p> <p>* One SCR with proper heat sink</p> <p>* Turn-ON transient turn off transient characteristics can be studied.</p> <p>* IC Based square wave generation for <math>V_{AK}</math> and <math>V_{GK}</math></p> <p>* One No. of fixed load resistor.</p> <p>b). Power Supply :</p> <p>* 230V AC Input, <math>\pm</math> <u>Suitable value</u> V DC for control circuit</p> <p>* Power ON/OFF switches with indication.</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p><b>SUGGESTED EXPERIMENTS :</b></p> <p>1. To plot dynamic characteristics of SCR</p>	1
11	Trainer kit for phase control using R, RC and UJT Trigger circuit with Single phase controlled rectifier	<p><b><u>UJT, R, R-C CIRCUITS TRIGGERING FIRING MODULE</u></b></p> <p>* Consists of three types of basic firing circuit to trigger SCR.</p> <p>* Separate sections for R - firing, RC - firing, UJT firing circuit.</p> <p>* <u>Suitable value</u> [V AC / AMP] provided for firing circuit input voltage.</p> <p>* One potentiometer used to vary the firing angle of UJT firing circuit.</p> <p>* One potentiometer used to vary the firing angle of R - firing circuit.</p> <p>* One potentiometer used to vary the firing angle of RC - firing circuit.</p> <p>* One no. toggle switch for ON/OFF <u>Suitable value</u> VAC.</p> <p>* Four No's firing pulses terminated on the front panel for connecting external device module. (UJT firing circuit)</p> <p>* 1:1:1 Pulse transformer used for UJT firing circuit pulse isolation.</p> <p>* One no. SCR with snubber circuit forms half wave controlled converter circuit for checking all three firing circuit.</p> <p>* 230V, 50HZ AC input, fuse provided for over load protection.</p> <p>* One no. rocker switch with LED</p> <p>Indication for power ON/OFF.</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p><b>SUGGESTED EXPERIMENTS :</b></p> <p>1. Study of UJT firing circuit.</p>	1

		<p>2. Obtain the load voltage waveform for UJT Trigger circuit with Single phase controlled rectifier</p> <p>3. Single phase half wave controlled converter using R - firing.</p> <p>4. Single phase half wave controlled converter using RC - firing.</p> <p>5. Analysis of load voltage for different firing angles for Rand RC firing</p>	
12	Trainer kit for AC Voltage Controller using TRIAC	<p><b><u>AC PHASE CONTROL USING SCR</u></b></p> <p>This trainer module consists of two separate section</p> <ol style="list-style-type: none"> <li>UJT based firing circuit for SCR AC Regulator</li> <li>DIAC , R &amp; C based firing circuit for TRIAC AC Regulator</li> </ol> <p>UJT based firing circuit for SCR AC Regulator :</p> <p><u>Suitable value</u> V AC for UJT firing circuit (<u>Suitable value</u> AC obtained through 230/ <u>Suitable value</u> V AC, A step down transformer)</p> <ul style="list-style-type: none"> <li>One potentiometer is used to vary the firing angle</li> <li>Two isolated pulses for SCR</li> <li>Isolation obtained by pulse isolation transformer</li> <li>Two no. of SCR with heat sink (600V, 12A) provided for power circuit</li> <li>Power circuit input volt 0-230V AC (External)</li> <li>fan load</li> </ul> <p><b>b. DIAC based firing circuit for TRIAC AC Regulator</b></p> <p>DIAC firing for TRIAC</p> <ul style="list-style-type: none"> <li>One TRIAC with heat sink (600V/12A)</li> </ul> <p>*230V operation</p> <ul style="list-style-type: none"> <li>One lamp load or fan(Optional)</li> </ul> <p>*One potentiometer is used to vary the firing angle Output voltage 0- 230V AC</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p><b>SUGGESTED EXPERIMENTS :</b></p> <ol style="list-style-type: none"> <li>speed control of fan using TRIAC</li> </ol>	1
		<p><b><u>SINGLE PHASE SCR BRIDGE CONVERTER</u></b></p> <p>* Consists of firing circuit, SCR power circuit and load.</p> <p>* Line synchronized IC based linear firing circuit.</p> <p>* Line synchronization achieved by step - down transformer.</p> <p>* Four no. firing pulses to trigger four SCRs.</p>	



13	Trainer kit for Single Phase fully controlled SCR Bridge circuit	<p>* 1:1:1 Pulse transformer used for pulse isolation.</p> <p>* One No. Potentiometer used to vary the firing angle (<math>180^\circ - 0^\circ</math>).</p> <p>* Carrier logic implemented carrier frequency KHz.</p> <p>* One no. toggle switch with debouncing logic for pulse ON/OFF.</p> <p>* Provision to control the firing angle through external [Any value].</p> <p>* Power circuit consists of four no. SCR with fuse protection.</p> <p>* Anode, Cathode, Gate terminals are terminated in the front panel for user connection.</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p>* <u>Suitable value</u> [V AC, AMP] provided for power circuit input with ON/OFF switch.</p> <p>* One no. fixed R, L load provided.</p> <p>* 230V, 50Hz AC input with ON/OFF rocker switch, fuse for over load.</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p><b>SUGGESTED EXPERIMENTS :</b></p> <ol style="list-style-type: none"> <li>1. Single phase fully controlled converter with R and R - L load.</li> <li>2. Study the operation of single phase fully controlled converter with RL load &amp; with &amp; without freewheeling diode</li> </ol> <p><b>Note: 1.demonstration necessary</b></p> <p><b>2.povision to connect and disconnect freewheeling diode</b></p>	1
14	Trainer kit for Single-phase half bridge/full bridge inverter using power MOSFET/IGBT	<p><b>Single-phase half bridge/full bridge inverter using power MOSFET/IGBT</b></p> <p>Aim: Design and set up a single phase half-bridge/full-bridge inverter and observe the waveforms across load and firing pulses.</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p><b>SUGGESTED EXPERIMENTS :</b></p> <ol style="list-style-type: none"> <li>1. To control the output of the IGBT based inverter using PWM technique</li> </ol>	1
		<p><b>Step down Chopper using MOSFET</b></p> <p>* One number of powers MOSFET used as power switch with suitable heat sink.</p> <p>* IC based PWM generator.</p> <p>* One number of high speed Opto isolator provided for PWM isolation.</p> <p>* Driver IC used to drive power</p>	

15	Trainer kit for Step down Chopper using MOSFET	<p>switch.</p> <p>* High frequency transformer provided for isolation.</p> <p>* Power circuit I/P voltage: <u>Suitable value</u> (DC).</p> <p>* Output voltage: <u>Suitable value</u> [VDC/ amp].</p> <p>230V AC input, <u>Suitable value</u> DC for control circuit.</p> <p>* One number of fuse provided for protection.</p> <p>* Voltage feed back from the output for closed loop operation.</p> <p>* One no. of Potentiometer used for PWM variation</p> <p>* L &amp; C provided for filters</p> <p>* Necessary test points are terminated at sockets so that the student can monitor / measure / study the signals using CRO, DVM, etc.,</p> <p>SUGGESTED EXPERIMENTS :</p> <p>1. To obtain the output voltage waveform for resistive load</p>	1
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#### LIST OF ITEMS FOR ADVANCED ELECTRICAL ENGINEERING LAB

Sl. No	Item name	Specifications	No of Units required
1	Signal Generator	<p>2 MHz, microcontroller based function generator</p> <p>Frequency range:0-2MHz</p> <p>Frequency Resolution: 0.001Hz</p> <p>Frequency error: <math>&lt;10^{-7}</math></p> <p>Power output : -120dB to +10dB or better</p> <p>Resolution: 0.01dB</p> <p>Modulation: AM, FM, Phase Mod, Pulse Mod</p> <p>Interface: IEEE 488, Ethernet port, USB</p> <p><b>Note: demonstration Required</b></p>	2
2	lead/lag networks	<p>Experimental determination of frequency response of lead/lag networks</p> <p>a peak percent overshoot M variable 20-50%</p> <p>b steady state P error variable 50 -0.5%</p> <p>c compensation network implementation through built in variable gain amplifier</p>	1



		<p>d adjustable gain</p> <p>e built in square and sine wave generators for transient and frequency response studies.</p> <p>Frequency adjustable 20-800Hz(approx)</p>	
3	Relay Control System	<p>Relay Control System consisting of</p> <p>a Electronic relay using high speed ICs</p> <p>b dead zone variable 0-600mV</p> <p>c hysteresis variable 0-500mV</p> <p>d built in signal source: sine &amp; square waves of amplitude 0-1V (min)</p> <p>e variable frequency: 0-1kHz</p> <p>f IC regulated internal power supply</p> <p>(literature&amp; patch cords inclusive)</p>	1
4	Trainer kit for Experiment using PLC	<p><b>PROGRAMMABLE LOGIC CONTROLLER TRAINER WITH DEMONSTRATOR :</b></p> <p>This trainer is based on PLC &amp; consist of,</p> <p>i) Micro PLC</p> <p>ii) Programming Software,</p> <p>iii) Communication cable</p> <p>Demonstration panel consist of SPDT switches, as digital inputs LED Lamps to simulate digital outputs,</p> <p>software to program in ladder language.</p> <p>PLC Specifications</p> <p>* Digital inputs (24V DC)</p> <p>* Data memory 12KB, Program memory 12KB</p> <p>*0.22 msec bit operating speed</p> <p>*256 Timers, Counters.</p> <p>* Built in real time clock</p> <p>*24V DC power supply for operating voltage</p> <p>* RS485 Communication interface</p> <p>*6 High speed counter with 30 KHz</p> <p>*2PWM outputs with 20 KHz</p> <p>*2PWM outputs with 20 KHz</p> <p>*2PWM outputs with 20 KHz</p> <p>ii. 32 bit floating point for Arithmetic operation</p> <p>Demonstration Panel</p> <p>14 SPDT Switches provided to simulate to the digital inputs</p> <p>10 LED Lamps provided with fuse protection to simulate the digital outputs</p>	1

		<p>One 24 V DC source provided for panel utility.</p> <p>2 Channel PWM (or) HSC connecting facility</p> <p>All the components are mounted in attractive powder coated metal frame</p> <p>All inputs are terminated on the frontpanel on socket type connector for inter connecting of application.</p> <p>Programming Software :</p> <p>Windows based Power ful software provided to write program in ladder languages.</p> <p>Siemens PLC programming software.</p> <p># Step7 200.</p> <p># IEC 6113 standard</p> <p>Interface Cable</p> <p>A special point to point interface cable provided for communication.</p> <p><b>Note: demonstration necessary</b></p>	
5	8086	<p><b>8086/8088 MICROPROCESSOR TRAINER KIT Processor :</b></p> <p>* Intel 8086/8088 CPU at 4.77 MHz clock speed.</p> <p><b>Memory :</b></p> <p>*16 KB for monitor EPROM upgradable to 64 KB</p> <p>*16 KB RAM expandable to 64 KB</p> <p>* Battery backup provision for RAM up to 64 KB.</p> <p><b>Keyboard &amp; Display :</b></p> <p>* 16 x 2 Alpha numeric LCD Display</p> <p>* 101 Keys IBM Compatible Keyboard.</p> <p>Timer, Parallel I/O, Coprocessor, Interrupt and Bus Expansion:</p> <p>* 48 TTL I/O lines brought out to two nos of 26 pin FRC Connector.</p> <p>* 1 Number of standard RS232C compatible serial port brought out to a 9 pin D type male connector.</p> <p>* One RS232 Cable provided.</p> <p>* 3 Channel 16 bit counter/timer using 8253 terminated in a 10 pin connector (One Channel Used for baud rate generation.)</p> <p>* Fully buffered address data and control signals terminated at a 50 pin header</p> <p>(VXTBUS) for interfacing VBMB Series of experiment boards and bus expansion.</p> <p>* 8 Nos. of Interrupts using 825</p>	2



**Special Features :**

- \* Kit Operates with a single +5V/D.C supply
- \* The Kit and the Power Supply are mounted on a attractive light Gray Color fiber glass cabinet with fiber glass top cover

**Software**

- \* Built-in line assembler and disassembler
- \* Powerful debugging monitor to develop user program.

**Documentation Support : (2 Manuals)**

- \* MICRO 86/88 Technical Reference Manual
- \* User/Student's Work Book.

**Built-in SMPS Power Supply**

- \* Input: 230V A.C.
- \* Output: +5V / 3.5 A, +12V / 150 mA.

**Note: demonstration if necessary**

**8051 MICROCONTROLLER TRAINER KIT****Processor :**

- \* 89C51 Microcontroller, 12MHz Clock speed

**Memory :**

- \* Program Memory RAM-32KB
- \* Data Memory RAM-32KB
- \* Program Memory EPROM-32KB

**Peripherals**

Keyboard and Display

- \*16 x 2 LCD Display

\*IBM PC Keyboard is provided and also reset and interrupt keys are provided

(RREKey)

**Parallel I/O Bus Expansion**

- \* One no. of 8255 connections are terminated in one 26-pin FRC header (24 I/O lines)

- \* One VXT-Bus (50 pin FRC connector) for interfacing VBMB series of experiment

board and bus expansion

- \* Microcontroller port lines are terminated with one 40-pin FRC header

Digital I/O

- \* On board 8-digital inputs can be given through 8-Way dip switch

- \* On board 8-digit outputs can be visible through SMD LEDs

- \* The port lines PI used as input (switch) or output LED (selectable

		<p>hardware)</p> <p><b>Special Features :</b></p> <ul style="list-style-type: none"> <li>* Software single stepping of user programming by instruction for software debugging</li> <li>(at same time user interrupt is not access)</li> <li>* Housed in a sleek plastic cabinet.</li> </ul> <p>Serial Port :</p> <ul style="list-style-type: none"> <li>* On chip serial port will be terminated in 9 pin D Male connector</li> </ul> <p><b>Built-in Power Supply (Multi output) SMPS :</b></p> <ul style="list-style-type: none"> <li>* Input : 230V AC</li> <li>* Output : +5V/3A, +12V/0.5A</li> </ul> <p><b>Battery Backup :</b></p> <ul style="list-style-type: none"> <li>* 1 No. of 3V lithium battery / 3.6V NICD Battery</li> </ul> <p><b>Documentation Support (2 Manuals) :</b></p> <ul style="list-style-type: none"> <li>* Micro - 51 LC User manual</li> <li>* Micro - 51 LC (LCD) technical reference manual</li> </ul> <p><b>Note: demonstration if necessary</b></p>	
7	ADC	<p>8 CHANNEL ADC INTERFACE BOARD :</p> <ul style="list-style-type: none"> <li>* Incorporates ADC 0809</li> <li>* Start of Conversion by manual switch or software</li> <li>* End of Conversion (EOC) monitored through *Interrupt / Polling</li> <li>* Display of digital data using LED's</li> <li>* All the 8 channel analog inputs terminated at *Screw type connector.</li> <li>* Trimpot is provided on-board to channel 0 or 3 or 6</li> <li>* Provision for test points &amp; fault analysis points</li> <li>* 50 Core Cable</li> <li>* All Address, data and control lines are terminated in a 50 Pin FRC OEN make male connector to interface with VXT bus</li> </ul> <p><b>Note: demonstration necessary</b></p>	2
8	DAC	<p>2 CHANNEL DAC INTERFACE BOARD</p> <ul style="list-style-type: none"> <li>* Two numbers of DAC 0800</li> <li>* Analog Output: +5V to -5V</li> <li>* DAC outputs are terminated at a suitable connector available on-board</li> <li>* Provision for test points &amp; fault analysis points.</li> <li>* All Address, data and control lines are terminated in a 50 Pin FRC OEN make male</li> <li>Connector to interface with VXT bus.</li> <li>* 50 Core Cable</li> </ul>	2



Note: demonstration necessary

**LIST OF ITEMS FOR ELECTRICAL MACHINES LAB**

No	Particulars	Specifications	Qty(Nos)
1	Ammeter MC	250mA	2
2	Ammeter MC	2A	2
3	Ammeter MC	15A	2
4	Ammeter MC	20A	4
5	Ammeter MI	250mA	2
6	Ammeter MI	2A	2
7	Ammeter MI	15A	2
8	Ammeter MI	20A	4
9	Voltmeter MC	2V	2
10	Voltmeter MC	20V	1
11	Voltmeter MC	30V	1
12	Voltmeter MC	50V	2
13	Voltmeter MC	150V	2
14	Voltmeter MC	250V	2
15	Voltmeter MC	500V	1
16	Voltmeter MI	20V	1
17	Voltmeter MI	30V	1
18	Voltmeter MI	50V	2
19	Voltmeter MI	150V	2
20	Voltmeter MI	250V	4
21	Voltmeter MI	500V	2
22	Wattmeter UPF	125/250/500V, 15/30A	1
23	Wattmeter UPF	62.5/125/250V, 5/10A	3
24	Wattmeter UPF	250/500V, 15A	2
25	Wattmeter LPF	62.5/125/250V, 1/5A	2
26	Rheostat	15 $\Omega$ , 2A	2
27	Rheostat	250 $\Omega$ , 2A	2

28	Rheostat	500 $\Omega$ , 2A	2
29	Rheostat	750 $\Omega$ , 1.5A	1
30	Rheostat	350 $\Omega$ , 5A	2
31	Loading Rheostat	1 phase 5kW, 250V	2
32	Loading Rheostat	3 phase 5.1kW, 500V	2
33	2 point starter	220V, 5HP for DC motor	2
34	3 point starter	220V, 5HP for DC motor	3
35	Auto transformer	230/0-270V, 8A, 1 $\phi$	2
36	Auto transformer	230/0-270V, 20A, 1 $\phi$	2
37	Loading system for motors with spring balance and accessories	For 5 HP motor	3
38	Multimeter Analog(HD)	0-10A(AC/DC), 0-1meg $\Omega$ 0-1000V( AC/DC)	1
39	Signal generator cum frequency counter	Sine, triangle, ramp, square 0-5Mhz	1
40	Frequency meter	0-1khz(lab type)	2
41	Star delta starter	Automatic 5 HP 440V 3 $\phi$	3

Balakrishna Pillai M

Principal

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