

**LIST OF EQUIPMENTS
FOR THE BS IN ELECTRICAL ENGINEERING PROGRAM OF SSCT
AS OF NOVEMBER 2020**

Notes:

* If equipment is listed as “Not Available,” it might have been listed already in PPMP 2021. If PPMP must follow ChEd guidelines (good for 1 section with 25 students and 5 per group, and if target is 1 section only with 25 students), then it must be checked for the quantity listed to be purchased.

* If equipment is listed as “available” and when checked in inventory, is lacking in quantity, then there’s a need to buy additional of the same kind or buy new ones.

* For “repeated” equipment from the list, the device in the list is already repeated therefore can be ignored.

* Link to 2020 Inventory: <https://drive.google.com/drive/u/2/folders/1-5AQGPHWGhu1HtDFFxOY9fyMwvIBf3ER>

* Link to 2021 PPMP: https://drive.google.com/file/d/1TAzEfWgigtyoCIWEfiev40s_ByFI7-tw/view?usp=sharing

* The ACTION column concludes whether the device is all available, not available but already listed in PPMP 2021, or whether additional units need to be listed in another PPMP for purchase.

I- ALLIED COURSES

ELECTRONIC CIRCUITS: DEVICES AND ANALYSIS

Recommended Laboratory Exercises	Required Equipment/Apparatus	STATUS	Supporting Document: Item No. (from 2020 Inventory)	ACTION
1. Diode Characteristics	DC Power Supply	Available	9, 14,15	Already in PPMP
	Digital Multimeter (DMM)	Available	10	Already in PPMP
	Breadboard	Available	14,17, 36, 37,38	Already in PPMP
	Oscilloscope	Available	13, 33	Already in PPMP
	Desktop Computer	Available	30	6 in PPMP, add 19
2. The Diode Limiter, Diode Clamper, Rectifiers and Filters, Voltage Doubler	Function Generator	Available	12, 40	Already in PPMP
	Semiconductor Devices	Available	14,17, 36, 37, 38	Already in PPMP
	Circuit Board with Power Supply	Available	14,17, 36, 37,38	Buy 0, can use other boards
	Oscilloscope	Available	13,33	<i>Repeated</i>
	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>
	Desktop Computer	Available	30	<i>Repeated</i>
3. Zener Diode and Voltage Regulation	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>
	Breadboard	Available	14,17, 36, 37,38	<i>Repeated</i>
	Semiconductor Devices	Available	37	Already in PPMP
	Circuit Board with Power Supply	Available	14,17, 36, 37,38	<i>Repeated</i>
	DC Supply	Available	9,1 4, 15	<i>Repeated</i>
	Desktop Computer	Available	30	<i>Repeated</i>
4. BJT Characteristics and Biasing	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>
	Semiconductor Devices	Available	14,36	Already in PPMP
	Circuit Board with Power Supply	Available	14,17, 36, 37,38	<i>Repeated</i>
	Desktop Computer	Available	30	<i>Repeated</i>
5. Small-signal Amplifier a. Common-Base b. Common-Emitter c. Common-Collector	Digital Multimeter	Available	10	<i>Repeated</i>
	Transistor Amplifier	Available	14,17, 36, 37, 38	Already in PPMP
	Circuit Board with Power Supply	Available	14,17, 36, 37,38	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
6. JFET Amplifier	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>

	FET Fundamentals	Available	14,36	Already in PPMP
	Circuit Board with Power Supply	Available	14,17, 36, 37,38	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
7. BJT/JFET Frequency Response	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>
	Transistor Power Amplifier	Available	14,17, 36, 37, 38	Already in PPMP
	Circuit Board	Available	14,17, 36, 37,38	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
8. BJT/JFET Frequency Response	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>
	Transistor Power Amplifier	Available	14,17, 36, 37, 38	Already in PPMP
	Circuit Board	Available	14,17, 36, 37,38	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
9. Cascaded Amplifier	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>
	Transistor Amplifier	Available	14,17, 36, 37, 38	Already in PPMP
	Circuit Board	Available	14,17, 36, 37,38	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
10. Power Amplifier	Digital Multimeter (DMM)	Available	10	<i>Repeated</i>
	Transistor Power Amplifier	Available	14,17, 36, 37,38	Already in PPMP
	Circuit Board	Available	14,17, 36, 37,38	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
11. Differential Amplifier, Inverting/Noninverting Operational Power Amplifiers, Operational Amplifier Applications	Digital Multimeter	Available	10	<i>Repeated</i>
	Function Generator	Available	12, 40	Already in PPMP
	Digital Oscilloscope	Available	13, 33	<i>Repeated</i>
	Operational Amplifier	Available	14,17, 36, 37,38	<i>Repeated</i>
	Circuit Board	Available	14,17, 36, 37,38	<i>Repeated</i>
12. Feedback Amplifier	Digital Multimeter	Available	10	<i>Repeated</i>
	Transistor Feedback Circuit	Available	14,17, 36, 37,38	Already in PPMP
	Circuit Board	Available	14,17, 36, 37,38	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
13. Square Wave Oscillators	Digital Multimeter	Available	10	<i>Repeated</i>
	DC Power Supply	Available	9, 14,15	<i>Repeated</i>
	Digital Oscilloscope	Available	13, 33	<i>Repeated</i>
	Breadboard	Available	14,17, 36, 37,38	<i>Repeated</i>
14. Familiarization with Digital Circuits	DC Power Supply	Available	9, 14,15	<i>Repeated</i>
	VOM	Available	10	<i>Repeated</i>
	Digital Oscilloscope	Available	13, 33	<i>Repeated</i>
	Digital Circuit Training Board	Available	15, 18, 35,39	<i>Repeated</i>

INDUSTRIAL ELECTRONICS

Recommended Laboratory Exercises	Required Equipment/Apparatus	STATUS	Supporting Document: Item No. (from 2020 Inventory)	ACTION
1. Filters	Filter Experimental Module	Available	38	<i>(Components can be capacitors, resistors, inductors)</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	DC Supply	Available	9, 14,15	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
2. Voltage Multipliers	(same with 1)	Available	(same with 1)	<i>Repeated</i>
3. Voltage Regulator	(same with 1)	Available	(same with 1)	<i>Repeated</i>

4. DC Characteristics of Thyristors and other Switching Devices, Thyristors and Phase Control Circuits	Multimeter	Available	10	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
	Signal Generator	Available	12, 40	<i>(Function generator is substitute; function generator is higher)</i>
	Regulated, variable DC power supply	Available	9, 14,15	<i>Repeated</i>
	SCRs	Available	14,36,38	Already in PPMP
	TRIACs	Available	14,36,38	Already in PPMP
	UJTs	Available	14,36,38	Already in PPMP
	Capacitors	Available	not listed	Already in PPMP
	Resistors	Available	not listed	Already in PPMP
	Potentiometers	Available	not listed	Already in PPMP
	Breadboard	Available	14,17, 36, 37,38	<i>Repeated</i>
	SPST Switches	Available	38	Already in PPMP
	Lamp	Available	38	Already in PPMP
	DC Motor	Not Available	n/a	Already in PPMP
5. Optoelectronics Devices	Oscilloscope	Available	13, 33	<i>Repeated</i>
	Function Generator	Available	12, 40	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	LED	Available	38	Already in PPMP
	Laser Diode	Available	38	Already in PPMP
	Photodiode	Available	38	Already in PPMP
	Photodetector	Available	38	Already in PPMP
	Power Supply	Available	9, 14,15	<i>Repeated</i>
6. Transducers and Transmitters	Multimeter	Available	10	<i>Repeated</i>
	Oscilloscope	Available	13, 33	<i>Repeated</i>
	Signal Generator	Available	12, 40	<i>Repeated</i>
	Regulated, variable DC supply	Available	9, 14,15	<i>Repeated</i>
	Transducer and Transmitter Training Module	Available	38	Buy 5 sets of transducers and transmitter components or 5 sets of modules
7. Programmable Controllers-PLC Basics	PC Workstation	Available	30	<i>Repeated</i>
	PLC Training Module with simulation software for PLC	Available	31,41	Buy 0
8. PLC timers, counters, and applications	(same with 7)	Available	(same with 7)	<i>Repeated</i>

II- PROFESSIONAL COURSES

ELECTRICAL CIRCUITS I

Recommended Laboratory Exercises	Required Equipment/Apparatus	STATUS	Supporting Document: Item No. (from 2020 Inventory)	ACTION
1. Familiarization with electrical measuring instruments and devices	Circuit Training Kit/Module	Available	14,15,37	Only 4 (different boards), buy 5 same boards
	Analog/digital Multimeter	Available	10	<i>Repeated</i>
	Analog/digital milliammeter	Not Available	n/a	<i>Repeated</i>
	Analog/digital ammeter	Available	10	<i>Repeated</i>
	Analog/digital voltmeter	Available	10	<i>Repeated</i>
	Variable/fixed regulated power supply	Available	9, 14,15	<i>Repeated</i>
	Analog/digital wattmeter	Not Available	n/a	Already in PPMP
Rheostat (variable resistor)	Available	14	Already in PPMP	
	Multimeter	Available	10	<i>Repeated</i>

2. Design of voltage divider circuits	DC ammeter	Available	10	<i>Repeated</i>
	DC voltmeter	Available	10	<i>Repeated</i>
	Variable/fixed DC regulated power supply	Available	9, 14,15	<i>Repeated</i>
	Calibrated potentiometer	Available	14	Already in PPMP
	Variable resistive load	Not Available	n/a	Already in PPMP
	Connecting wires	Available	not listed	Already in PPMP
3. Complete response of first-order dynamic circuits	Computer system	Available	<i>Repeated</i>	<i>Repeated</i>
	Computer-aided circuit analysis software	Available	53	<i>Newly purchased; Buy 0</i>
4. Voltage-current relationships in resistive, inductive, and capacitive circuits with sinusoidal excitation	Multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	3 in PPMP, add 2
	AC voltmeter	Available	10	3 in PPMP, add 2
	Function generator	Available	12, 40	<i>Repeated</i>
	Dual trace oscilloscope	Not Available	(dual trace oscilloscope is an old, bulky, analog oscilloscope; digital is available)	No action
	Variable resistive load	Not Available	n/a	Already in PPMP
	Variable inductive load	Not Available	n/a	Already in PPMP
	Variable capacitive load	Not Available	n/a	Already in PPMP
5. At least two design experiments on selected topics	Combination of existing lab apparatus, instruments, devices;	Available	all listed	Buy 0
	Available freeware for circuit analysis (capable of doing DC analysis, transient analysis, AC analysis)	Available	53 (or freeware like PSPICE)	Buy 0

Recommended Laboratory Exercises	Required Equipment/Apparatus	STATUS	Supporting Document: Item No. (from 2020 Inventory)	ACTION
1. Design and applications of impedance bridge circuits	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Function generator	Available	12, 40	<i>Repeated</i>
	Calibrated potentiometer	Available	not listed	<i>Repeated</i>
	Variable resistor	Available	not listed	<i>Repeated</i>
	Variable inductor/capacitor	Available	not listed	<i>Repeated</i>
	Inductive load	Available	not listed	<i>Repeated</i>
	Capacitive load	Available	not listed	<i>Repeated</i>
2. Power in AC circuits, maximum power transfer principle	Connecting wires	Available	not listed	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Function generator	Available	12, 40	<i>Repeated</i>
	Wattmeter	Not Available	n/a	<i>Repeated</i>
	Variable resistive, inductive, capacitive load	Available	14,15,37	<i>Repeated</i>
3. Power factor correction	Connecting wires	Available	not listed	<i>Repeated</i>
	(same with 2)	(same with 2)	(same with 2)	<i>Repeated</i>
4. Series-tuned and parallel-tuned circuits	(same with 2)	(same with 2)	(same with 2)	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Function generator	Available	12, 40	<i>Repeated</i>
	Variable resistor	Available	14,15,37	<i>Repeated</i>
	Variable inductor	Available	14,15,37	<i>Repeated</i>
	Variable capacitor	Available	14,15,37	<i>Repeated</i>
Connecting wires	Available	not listed	<i>Repeated</i>	

5. Two-port network analysis of RLC circuits	Circuit Training Kit/Module	Available	14,15,37	<i>Repeated</i>
	Analog/digital multimeter	Available	10	<i>Repeated</i>
	AC milliammeter	Available	10	
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Function generator	Available	12, 40	<i>Repeated</i>
	Variable resistor, variable resistive load	Not Available	n/a	<i>Repeated</i>
	Variable inductive load	Available	14,15,37	<i>Repeated</i>
	Variable capacitive load	Available	14,15,37	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
6. Voltage and current relationships in balanced three-phase systems	Three-phase power supply	Not Available	n/a	Buy 0 (To request installation from SSCT Electrical division in-charge)
	Analog/Digital multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Fixed resistor, inductor and capacitor	Available	Three-phase power supply	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
7. Power measurement in balanced three-phase, 3-wire and 4-wire systems	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	Analog/Digital multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Single-phase wattmeter	Not Available	n/a	<i>Repeated</i>
	Lamp loads	Available	not listed	<i>Repeated</i>
	3-phase inductive load	Not Available	n/a	2 in PPMP, add 3
	Connecting wires	Available	not listed	<i>Repeated</i>
8. Analysis of three-phase systems with unbalanced loading	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	Analog/Digital multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Single-phase wattmeter	Not Available	n/a	<i>Repeated</i>
	Single-phase inductive load	Not Available	n/a	Already in PPMP
	Single-phase capacitive load	Not Available	n/a	Already in PPMP
	Lamp load	Available	not listed	<i>Repeated</i>
	3-phase inductive load	Not Available		<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
9. Power factor correction in three-phase systems	Three-phase power supply	Not Available		<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Variable capacitor	Available	not listed	<i>Repeated</i>
	3-phase inductive load	Not Available		<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
10. Analysis of circuits with magnetically coupled-coils	AC power supply	Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Rheostat	Available	not listed	Already in PPMP
	Two-winding transformer	Not Available		2 in PPMP, add 3
	Variable-resistive load	Available	not listed	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
11. At least four design experiments on selected topics	Combination of existing lab apparatus, instruments, devices	Available	all listed	Buy 0
	Available freeware for circuit analysis (capable of doing DC analysis, transient analysis, AC analysis)	Available	53 (or freeware like PSPICE), 50	Buy 0

ELECTRICAL CIRCUITS 2

AC APPARATUS AND DEVICES

Recommended Laboratory Exercises	Required Equipment/Apparatus	STATUS	Supporting Document: Item No. (from 2020 Inventory)	ACTION
1. Characteristic tests of a single-phase two-winding transformer: polarity test, open circuit test, short circuit test	Single-phase AC power supply	Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Wattmeter	Not Available	n/a	<i>Repeated</i>
	Variable autotransformer (VARIAC)	Not Available	n/a	3 in PPMP, add 2
	connecting wires	Available	not listed	<i>Repeated</i>
2. Voltage regulation and efficiency of a transformer	Single-phase AC power supply	Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	Variable autotransformer (VARIAC)	Not Available	n/a	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Power factor meter	Not Available	n/a	
	Two-winding transformer	Not Available	n/a	<i>Repeated</i>
	Variable resistive load	Not Available	n/a	<i>Repeated</i>
	Variable inductive load	Not Available	n/a	<i>Repeated</i>
	Variable capacitive load	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
3. Conversion of a two-winding transformer into an autotransformer	Single-phase AC power supply	Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	Variable autotransformer (VARIAC)	Not Available	n/a	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Two-winding transformer	Not Available	n/a	<i>Repeated</i>
	Variable resistive load	n/a	Not Available	<i>Repeated</i>
	Variable inductive load	n/a	Not Available	<i>Repeated</i>
	Variable capacitive load	n/a	Not Available	<i>Repeated</i>
Connecting wires	Available	not listed	<i>Repeated</i>	
4. Parallel operation of a single-phase transformer	Single-phase AC power supply	Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	Variable autotransformer (VARIAC)	Not Available	n/a	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Power factor meter	Not Available		<i>Repeated</i>
	Two-winding transformer	Not Available	n/a	<i>Repeated</i>
	Variable resistive load	Not Available	n/a	<i>Repeated</i>
	Variable inductive load	Not Available	n/a	<i>Repeated</i>
	Variable capacitive load	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>

5. The three-phase transformer and the three-phase transformer bank	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Three-phase transformer	Not Available	n/a	2 in PPMP, add 3
	Single-phase two winding transformer	Not Available	n/a	<i>Repeated</i>
	Three-phase inductive load	Not Available	n/a	2 in PPMP, add 3
	Connecting wires	Available	not listed	<i>Repeated</i>
6. The open delta or V-V connection of single-phase transformers	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Single-phase two winding transformer	Not Available	n/a	<i>Repeated</i>
	Three-phase inductive load	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
7. The Scott-connection or T-T connection of two single-phase transformers	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Single-phase two winding transformer (with 50% and 86.6% taps on both primary and secondary)	Not Available	n/a	<i>Repeated</i>
	Three-phase inductive load	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
8. Parallel operation of three-phase transformers or three-phase banks	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Power factor meter	Not Available	n/a	<i>Repeated</i>
	Three-phase transformer	Not Available	n/a	2 in PPMP, add 3
	Single-phase two-winding transformer	Not Available	n/a	<i>Repeated</i>
	Three-phase inductive load	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>

ELECTRIC MACHINES 2

Recommended Laboratory Exercises	Required Equipment/Apparatus	STATUS	Supporting Document: Item No. (from 2020 Inventory)	ACTION
1. Familiarization with electromechanical energy conversion equipment	DC compound machine	Not Available	n/a	2 in PPMP, add 3
	Multimeter	Available	10	<i>Repeated</i>
	Cage rotor induction machine	Not Available	n/a	2 in PPMP, add 3
	Slip ring machine	Not Available	n/a	3 in PPMP, add 2
	DC ammeter	Available	10	<i>Repeated</i>

	DC voltmeter	Available	10	<i>Repeated</i>
	Rheostat	Available	not listed	<i>Repeated</i>
	DC power supply	Available	9, 14,15	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
2. Characteristics of the DC shunt, series, compound motor	Multimeter	Available	10	<i>Repeated</i>
	DC compound machine	Not Available	n/a	<i>Repeated</i>
	DC power supply	Available	9, 14,15	<i>Repeated</i>
	DC ammeter	Available	10	<i>Repeated</i>
	DC voltmeter	Available	10	<i>Repeated</i>
	Torque meter	Not Available	n/a	Buy 5
	Rheostat	Available	not listed	<i>Repeated</i>
	Variable resistive load	Not Available	n/a	<i>Repeated</i>
	General purpose rheostat	Available	not listed	Already in PPMP
	Connecting wires	Available	not listed	<i>Repeated</i>
3. Parallel operation of DC generators	Multimeter	Available	10	<i>Repeated</i>
	DC compound machine	Not Available	n/a	<i>Repeated</i>
	DC power supply	Available	9, 14,15	<i>Repeated</i>
	DC ammeter	Available	10	<i>Repeated</i>
	DC voltmeter	Available	10	<i>Repeated</i>
	Rheostat	Available	not listed	<i>Repeated</i>
	Variable resistive load	Not Available	n/a	<i>Repeated</i>
	General purpose rheostat	Available	not listed	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
4. The squirrel-cage induction motor (SCIM) and the wound-rotor induction motor	Cage-rotor induction machine	Not Available	n/a	<i>Repeated</i>
	Slip ring machine	Not Available	n/a	<i>Repeated</i>
	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC wattmeter	Not Available	n/a	<i>Repeated</i>
	Torque meter	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
5. The synchronous motor	Slip-ring machine	Not Available	n/a	<i>Repeated</i>
	DC power supply	Available	9, 14,15	<i>Repeated</i>
	DC compound machine	Not Available	n/a	<i>Repeated</i>
	DC voltmeter	Available	10	<i>Repeated</i>
	Three-phase power supply	Not Available	n/a	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC wattmeter	Not Available	n/a	<i>Repeated</i>
	Torque meter	Not Available	n/a	<i>Repeated</i>
	Variable resistive load	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
Multimeter	Available	10	<i>Repeated</i>	
6. External characteristics of a three-phase alternator	Slip ring machine	Not Available	n/a	<i>Repeated</i>
	DC compound machine	Not Available	n/a	<i>Repeated</i>
	DC power supply	Available	9, 14,15	<i>Repeated</i>
	Rheostat	Available	not listed	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	DC voltmeter	Available	10	<i>Repeated</i>
	Wattmeter	Not Available	n/a	<i>Repeated</i>
	Variable resistive load	Not Available	n/a	<i>Repeated</i>
	Three-phase resistive load	Not Available	n/a	<i>Repeated</i>
	Three-phase inductive load	Not Available	n/a	<i>Repeated</i>
	Three-phase capacitive load	Not Available	n/a	<i>Repeated</i>
	Connecting wires	Available	not listed	<i>Repeated</i>
Multimeter	Available	10	<i>Repeated</i>	
7. Synchronization and parallel operation of three-phase alternators	Slip ring machine	Not Available	n/a	<i>Repeated</i>
	DC compound machine	Not Available	n/a	<i>Repeated</i>
	DC power supply	Available	9, 14,15	<i>Repeated</i>
	Rheostat	Available	not listed	<i>Repeated</i>

	Direct-on-line starter	Available	not listed	3 in PPMP, Add 2
	Synchroscope	Not Available	n/a	Buy 5
	DC ammeter	Available	10	<i>Repeated</i>
	DC voltmeter	Available	10	<i>Repeated</i>
	AC ammeter	Available	10	<i>Repeated</i>
	AC voltmeter	Available	10	<i>Repeated</i>
	Variable resistive load	Not Available	n/a	<i>Repeated</i>
	Three-phase resistive load	Not Available	n/a	<i>Repeated</i>
	Phase sequence indicator	Not Available	n/a	3 in PPMP, Add 2
	Data management system	Not Available	n/a	Free softwares available; Buy 0
	Connecting wires	Available	not listed	<i>Repeated</i>
	Multimeter	Available	10	<i>Repeated</i>
8. At least two design experiments to illustrate the industrial applications of AC machines	Available freeware for analysis of AC machine characteristics and performance	Available	50,53, PSPICE	Buy 0

INSTRUMENTATION AND CONTROL

Recommended Laboratory Exercises	Required Equipment/Apparatus	STATUS	Supporting Document: <u>Item No. (from 2020 Inventory)</u>	ACTION
	Adjustable DC power supply	Available	9, 14,15	<i>Repeated</i>
	Oscilloscope with connectors	Available	13, 33	<i>Repeated</i>
	Digital multi-meter	Available	10	<i>Repeated</i>
	VOM	Available	10	<i>Repeated</i>
	RLC meter	Not Available	n/a	Buy 5
	Power meter	Not Available	n/a	<i>Repeated</i>
	Signal Generator	Available	12, 40	<i>Repeated</i>
2. Sensors, transducers, transmitters, and actuators	Experimental module for sensors, transducers, transmitters, and actuators	Available	14,15,37,38	Already in PPMP
3. Data acquisition, ADC/DAC conversion, signal conditioning, recording and retrieval	Training module for analog, data acquisition, conversion, and digital data recording and retrieval	Available	15,17,18,35,37,38,39	Different boards less than 5, Buy 5 new sensor/module
4. Temperature Measurement	Temperature control training module	Available	37,38	Buy 5 sensor/module
5. Measurement of Pressure	Pressure control training module	Available	37,38	Buy 5 sensor/module
6. Measurement of flow rate and liquid level	Flow rate and level measurement training module	Not Available	n/a	Buy 5 sensor/module
7. On-off Control	On-off control training module	Available	38	Buy 5 sensor/module
8. PID control	PID controller training module	Available	38	Buy 5

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