Curriculum
for
Certificate Programme
In
Servicing and Maintenance of Electronic Instruments
for
Maharaja Ranjit Singh Punjab Technical University,
Bathinda (Punjab)

Prepared By:

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FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
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PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind:

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

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Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Electronics
2.	Name of the Certificate Programme	:	Servicing and Maintenance of Electronic Instruments
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	20 : 80 (Approx.)

2. JOB ROLE AND JOB OPPORTUNITIES

a) Job Role

A certificate holder in Servicing and Maintenance of Electronic Instruments is responsible for servicing, repair and maintenance of various electronic instruments by discovering faulty parts and also use proper tools to repair them.

b) Job Opportunities

On successful completion of this course, the candidates shall be gain fully employed in the following industries:

1. Various Consumer/Domestic Electronics Appliance Manufacturing Industry.
2. Service industries like BSNL, MTNL, Home appliances manufacturing company, Railways, ISRO, Naval dockyard, RCF, BPCL etc.
3. Manufacturers of Audio and Video Equipment
4. In public sector industries like BHEL, BEML, NTPC, AIR INDIA etc and private industries in India & abroad.
5. Various Consumer electronics company like Videocon, Samsung, LG, Onida, Akai, Panasonic, Sony, IFB, Godrej, , Whirlpool etc
6. Self employment

3. LEARNING OUTCOMES OF THE PROGRAMME

After undergoing the programme, students will be able to:

1. Identify various active and passive components and their applications.
2. Handle different types of Electronic measuring Instruments
3. Identify and rectify different types of faults in electronics equipments.
4. Repair, and maintenance of SMPS, UPS, Inverter, solar power system and various analog and digital circuits.
5. Repair, maintenance and installation of LED/ LCD TV.
6. Repair, maintenance and installation of Consumer electronics equipments like Washing Machine, Microwave oven, Induction cook top etc.
7. Repair, maintenance and Installation of DTH systems
8. Repair, maintenance and Installation of CCTV
9. Apply basic principles of math and physics in solving trade problems.
10. Communicate effectively in English with others.

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN SERVICING AND MAINTENANCE OF ELECTRONICS INSTRUMENTS

FIRST SEMESTER

CODE	UNITS	STUDY SCHEME Total Hours		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
CECE1-101	*Communication Skills	8	-	1	25	-	25	25	1	-	-	25	50
CECE1-101P	*Communication Skills Lab.	-	24	1	-	50	50	-	-	75	3	75	125
CECE1-102	Engineering Drawing **(S & MEI)	-	-	1	-	-	-	75	3	-	-	75	75
CECE1-102P	Engineering Drawing **(S & MEI) Lab.	-	32	1	-	50	50	-	-	-	-	-	50
CECE1-103	Basics of Electronics	32	-	2	25	-	25	50	2	-	-	50	75
CECE1-103P	Basics of Electronics Lab.	-	144	5	-	100	100	-	-	100	4	100	200
CECE1-104	Measuring Instruments	16	-	1	25	-	25	50	2	-	-	50	75
CECE1-104P	Measuring Instruments Lab.	-	80	3	-	50	50	-	-	100	4	100	150
CECE1-105	Power Supply	32	-	2	25	-	25	50	2	-	-	50	75
CECE1-105P	Power Supply Lab.	-	144	5	-	100	100	-	-	100	4	100	200
CECE1-106P	#Student Centred Activities (SCA)	-	48	2	-	25	25	-	-	-	-	-	25
CECE1-107P	+4 Weeks Industrial Training (during vacation)	-	-	4	-	-	-	-	-	100	3	100	100
Total		**88**	**472**	**28**	**100**	**375**	**475**	**250**	**-**	**475**	**-**	**725**	**1200**

* Common with other certificate programmes

** Servicing and Maintenance of Electronic Instruments

\# SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

\+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per semester = 16 Total working days per week = 5 Total hours per day = 7

Total Hours in a semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

CODE	UNITS	STUDY SCHEME Total Hours		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
CECE1-208	*Basic Sciences	48	-	3	25	-	25	50	2	-	-	50	75
CECE1-209	Introduction to Digital Electronics	16	-	1	25	-	25	50	2	-	-	50	75
CECE1-209P	Introduction to Digital Electronics Lab.	-	80	3	-	50	50	-	-	100	4	100	150
CECE1-210	Amplifier and Oscillators	16	-	1	25	-	25	50	2	-	-	50	75
CECE1-210P	Amplifier and Oscillators Lab.	-	112	3	-	50	50	-	-	100	4	100	150
CECE1-211	Power Electronics	16	-	1	25	-	25	50	2	-	-	50	75
CECE1-211P	Power Electronics Lab.	-	96	3	-	50	50	-	-	100	4	100	150
CECE1-212	Consumer Electronics	16	-	1	25	-	25	50	2	-	-	50	75
CECE1-212	Consumer Electronics Lab.	-	112	4	-	75	75	-	-	100	4	100	175
CECE1-213P	#Student Centred Activities (SCA)	-	48	2	-	25	25	-	-	-	-	-	25
CECE1-214P	+4 Weeks Industrial Training	-	-	4	-	-	-	-	-	100	3	100	100
Total		**112**	**448**	**26**	**125**	**250**	**375**	**250**	**-**	**500**	**-**	**750**	**1125**

* Common with other certificate programmes

\# SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

\+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)

ii. 5 Marks for attendance as per following:
(by the trainers of the department)

a)	75%	Nil
b)	75 - 80%	2 Marks
c)	80 - 85%	3 Marks
d)	Above 85%	5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	National Level participation or inter-University competition
b)	10	-	Participation in two of above activities
c)	5	-	Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1
SUBJECT CODE: CECE1-101
COMMUNICATION SKILLS

LEARNING OUTCOMES:
After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical (24 Hours)	**Theory (08 Hours)**
	Basics of Communication • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication (1 hour)
• Looking up words in a dictionary (meaning and pronunciation) (2 hours)	Functional Grammar and Vocabulary • Parts of speech • Tenses • Correction of incorrect sentences (2 hours)
• Self and peer introduction • Greetings for different occasions (1 hour)	Listening • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking • Importance • Methods to improve speaking • Manners and etiquettes (2 hours)
• Newspaper reading (1 hour)	Reading • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading (1 hour)
• Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours)	Functional Vocabulary - One-word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases (2 hours)

• Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours)	
• Write a short technical report • Letter writing (3 hours)	
• Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours)	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT – 1.2
SUBJECT CODE: CECE1-102
ENGINEERING DRAWING (S & MEI)

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Draw symbol and free hand sketches of various components
- Prepare and interpret drawings (block diagram/circuit diagram) of electronics instruments.

Practical **(32 hours)**	**Theory**
• Free hand sketches of straight line, square, rectangle, circle, polygon etc. (2 hours) • Free hand sketches of hand tools (2 hours) • Types of lines (2 hours) • Dimensions and its type. Use of drawing instruments, T square, set square etc. Lettering practice (2 hours) • Types of scaling of drawings. Electrical symbols (3 hours) • Symbols of electronic components (4 hours) • Schematic diagram of digital multimeter (4 hours) • Draw half wave, full wave and bridge rectifier circuits with and without filters (6 hours) • Block diagram/schematic diagram of regulated power supplies (4 hours) • Orthographic 1st angle projection (3 hours)	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Presentation
- Sketching
- Drawing
- Model/prototype making

UNIT - 1.3 : BASICS OF ELECTRONICS	
LEARNING OUTCOME: After undergoing this unit, the students will be able to: • Use safety measures • Identify and use different hand tools • Define basic terms related to electricity • Perform soldering and de-soldering of various types of electronic components • Describe working principle of a transformer • Solder and de-solder SMD components from given PCB • Identify and use solar cell	
Practical (144 hours)	**Theory (32 hours)**
• Care and safe working habits, safety precautions to be demonstrated to the trainees (3 hrs)	• Introduction to safety, safety signs and measures to be taken to maintain the standards of safety of personal working and the equipment (4 hrs)
• Demonstration and use of hand tools – screw drivers, pliers, tweezer, tester, wire stripper, electrician knife, steel rule, scriber, punches, hack-saw, hammers, files and drilling machines • Simple fitting practice and drilling practice (10 hrs)	• Identification, specifications, uses and maintenance of commonly used hand tools (4 hrs)
• Identify the phase/line, neutral and earth on power socket • Construct a test lamp and use it to check mains healthiness • Use a tester to check AC power • Measure the voltage between phase and ground, neutral and ground, and rectify earthing • Identify and test different AC mains cables • Skin the electrical wires/cables using the wire stripper and cutter • Measure the gauge of the wire using SWG	• Basic terms such as electric charges, potential difference, voltage, current, resistance. Basics of AC and DC. Terms such as +ve cycle, -ve cycle, frequency, time period. RMS, peak, P-P, instantaneous value. Single phase and three phase supply. Terms like line and phase, voltage and currents. Insulator, conductor and semi-conductor properties. Types of wires and cables, standard wire gauge (SWG) (7 hrs)

• Measure AC and DC voltages using multimeter (50 hrs)	
• Practice of soldering and de-soldering (7 hrs)	• Types of soldering guns related to temperature and wattages, solder and de-solder materials, use of flux (1 hr)
• Identify the different types of resistors • Measure the resistor values using colour code and verify the reading by measuring using multimeter • Identify the power rating according to size • Identify the different capacitors and measure capacitance of various capacitors using LCR meter/multimeter • Identify different inductors • Identify the different parts of a relay • Identify different types of mains transformers and test them • Identify the primary and secondary transformer windings • Measure the primary and secondary voltage of different transformer • Identify and use SPST, SPDT, DPST, DPDT, tumbler, push button, toggle, piano switches used in electronic industries (50 hrs)	• Ohms Law, resistor – definition, types of resistors, specific use, colour coding, power rating. • Types of capacitors, specifications and applications • Types of inductors, specification and applications • Electromagnetic relays, types, construction, specifications – coil voltage and contact current capacity • Working principle of a transformer, specification of a transformer, step-up, step-down and isolation transformers • Fuse – types, use of fuses and its rating • Different switches and their specifications and uses (10 hrs)
• Identification of 2,3,4 terminal SMD components • De-solder the SMD components from the given PCB	• Introduction to SMD and BGA technology. Identification of 2,3,4 terminal SMD components, Advantages over conventional lead components

• Solder the SMD components in the same PCB • Re-work of SMD/BGA • Check for cold continuity of PCB • Identification of loose/dry solder, broken tracks on printed wired assemblies (20 hrs)	• Introduction to solder paste and machine • Soldering/de-soldering of SM assemblies • Tips for selection and inspection of hardware, inspection of SM (4 hrs)
• Construction of solar panel and its applications i.e. solar light oven, traffic lights, mobile chargers etc. (4 hrs)	• Define components like solar cell, module, panel and array (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Workshop job

UNIT- 1.4
SUBJECT CODE: CECE1-104
MEASURING INSTRUMENTS

LEARNING OUTCOME:
After undergoing this unit, the students will be able to:

- Identify and use digital multimeter
- Use CRO
- Use Function Generator

Practical (80 hours)	**Theory (16 hours)**
• Measure and test the voltage of given cell and battery using digital multimeter (10 hours) • Use of multimeter to measure various functions (ACV, DCV, DCI, ACI, R) (18 hours) • Replace the fuse, battery for the given multimeter (8 hours) • Checking of open, close, short series and parallel circuits with multimeter (12 hours)	• Multimeter – Principle of digital multimeter, study of different controls, precautions to be taken in handling digital multimeter, frequently occurring problems in digital multimeter and the remedial measures (8 hours)
• Identify the different controls on the CRO front panel and observe the function of each control (18 hours) • Measure DC voltage, AC voltage, time period using CRO (10 hours)	• Working principle of CRO and its use (6 hours)
• Function generator, its use, generation and measurement of frequency and amplitude of various signals (4 hours)	• Basic principles of function generator (2 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Workshop job

UNIT - 1.5
SUBJECT CODE: CECE1-105
POWER SUPPLY

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Identify and test P-N diode and zener diode
- Construct and test diode as a half wave, full wave and bridge rectifier
- Identify and select transistors

Practical (144 Hours)	**Theory (32 hours)**
• Testing of diodes (15 hours) • Assemble and test – half wave, full wave and bridge rectifier circuits with and without filter (42 hours)	• Basic electronic components such as P-N diode, Zener diode (5 hours) • Working of half wave, full wave and bridge rectifier circuits (5 hours) • Types of filters (4 hours)
• Construct a fixed voltage regulator using 78XX/79XX series ICs (32 hours) • Construct a variable voltage regulator using LM 723 (30 hours)	• Voltage regulator circuit (3 hours) • Introduction to transistor and its application (10 hours)
• Observe the output voltage of different IC regulators by varying the input voltage (25 hours)	• Identify the pins of voltage regulator ICs (5 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Presentation
- Viva-voce
- Assembly and disassembly

SUBJECT CODE: CECE1-107
INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through firsthand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one-year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 20%
b) Industrial training report 50%
c) Presentation and viva-voce 30%

UNIT – 2.1
SUBJECT CODE: CECE1-208
BASIC SCIENCES

LEARNING OUTCOMES:
After undergoing this unit, the students will be able to:

- Apply the basic principles of Maths in solving the basic problems of the trade.
- Apply the basic principles of physics in solving the basic problems of the trade.

Practical	Theory (48 Hours)
	Mathematics • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	Physics • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours) • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and

	insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2
SUBJECT CODE: CECE1-209
INTRODUCTION TO DIGITAL ELECTRONICS

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Identify different logic gates by number printed on them
- Describe different logic levels of TTL & CMOS
- Construct truth tables using NAND and NOR gates

Practical **(80 hours)**	**Theory** **(16 hours)**
• Identify different logic gates (AND, OR, NAND, NOR, X-OR, X-NOR, NOT ICs) by the number printed on them and draw I/O pin-out numbers (16 hrs) • Verify the truth tables of all logic gate ICs by connecting switches and LEDs (16 hrs) • Construct and verify the truth table of all the gates using NAND and NOR gates (24 hrs) • Use digital IC tester to test various digital ICs (TTL and CMOS) (24 hrs)	• Introduction to digital electronics. Difference between analog and digital signals. (5 hrs) • Logic families and their comparison, logic levels of TTL and CMOS (5 hrs) • Logic gates and truth tables. (6 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT - 2.3
SUBJECT CODE: CECE1-210
AMPLIFIERS AND OSCILLATORS

LEARNING OUTCOME:
After undergoing this unit, the students will be able to:

- Describe various transistor configurations and their characteristics
- Identify type of biasing done
- Construct and test RC-coupled and Class A, B and C amplifiers

Practical (112 hours)	**Theory (16 hours)**
• Construct Transistor CB, CE, CC configuration circuits and test input and output characteristics (32 hours) • Construct and test RC coupled amplifier (20 hours) • Construct and test a Class A, B and C amplifier (40 hours)	• Transistor (CB, CE and CC) configurations and their characteristics and applications, transistor's biasing. (5 hours) • RC coupled amplifier, push-pull amplifier, voltae gain, concept of dB, dBM (7 hours)
• Construct and test a RC phase shift oscillator and a crystal oscillator (20 hours)	• Study of crystal and RC oscillators (4 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 2.4
SUBJECT CODE: CECE1-211
POWER ELECTRONICS

LEARNING OUTCOME:
After undergoing this unit, the students will be able to:

- Install UPS system and perform routine maintenance of batteries
- Identify various components of SMPS
- Diagnose and rectify faults in SMPS

Practical (96 hours)	**Theory (16 hours)**
• Identify and test MOSFET, IGBT, DIAC, SCR, TRIAC (28 hours)	• MOSFET – precautions while handling. • IGBT, DIAC, SCR, TRIAC – applications (6 hrs)
• Installation of UPS and inverters • Dismantle the UPS and identify the major parts of UPS and inverter • Testing of major components • Charging, discharging and testing of batteries (32 hours)	• Types of batteries used in UPS and inverters and their maintenance • Different types of inverters, UPS, working principle, specifications, explanation with the help of block diagram (4 hours)
• Use SMPS used in TVs and PCs for practice • Dismantle the given SMPS and find major sections/ICs components • Identify various input and output sockets/connections of the given SMPS • Identifying various faults in given SMPS and rectifying it (36 hours)	• Block diagram of switch mode power supplies in TVs and PCs, their working principles and briefly explain its circuit diagram (6 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 2.5
SUBJECT CODE: CECE1-212
CONSUMER ELECTRONICS

LEARNING OUTCOME:
After undergoing this unit, the students will be able to:

- Install, operate and maintain semi and fully automatic washing machines
- Diagnose faults in microwave oven and repair them
- Install DTH system and use SAT meter for mounting, tracking for azimuth and elevation angles
- Install, operate and maintain CCTV systems
- Operate LCD/LED projectors
- Identify and operate different controls on LED/LCD TV
- Repair of TV remote control

Practical (112 hours)	**Theory (16 hours)**
Washing Machine: (20 hours) • Installation of front load and top load washing machine • Identify the internal and external parts of semi-auto washing machine, fully automatic washing machine • Operate semi-auto and fully automatic washing machine • Repair and maintenance of semi and fully automatic washing machine	• Washing machine – different types of machines, washing techniques, parts of manual, semi-automatic and fully automatic machines, basic working principle of manual, semi-automatic and fully automatic machines, study the working of motors, different types of timers, power supply circuits (4 hours)
Microwave Oven: (14 hours) • Identify the internal and external parts of microwave oven • Identify the different touch pad controls and their functions • Testing of high voltage diode • Identify the HV capacitor and discharge it • Diagnosis of all types of faults	• Different types of oven. Study various functions of oven, electrical wiring diagram of microwave oven, working of power supply (2 hours)
Induction Cook-top: (14 hours) • Identify the faults in induction cook-top and rectify it • Dismantle and identification of various parts, wiring and tracing of various controls, electrical and electronics circuit in induction cook top • Replacing the induction tube (coil) in induction cook top	• Working principle of induction cook-top (heater), study of different features of machine. Types of induction tubes, study of different components of induction cook-top, fault identification, heat sinking in induction cook-top (2 hours)
DTH System: (20 hours) • Identification and use of DTH system assembly • Identification and use of different tools and equipments used in DTH installation procedure and cabling procedure	• Basic components of DTH system: PDA, LNBC, Satellite receiver terminal, dish installation aspects, Azimuth & elevation settings of dish/ DTH receiver. Types of cables used in DTH system, impedance and specification, Set top box features,

• Identification of various types of connectors, cables and wiring procedure. • Install a DTH system and get a TV station • Site selection, installation, mounting and tracking for azimuth and elevation angles using SAT meter. • Identify the faults in DTH system and rectify • Identification and use of various I/O ports of STB (Set Top Box). • STB connection and first installation • Identify the faults in STB & rectify.	block diagram of set top box, I/O ports (2 hours)
CCTV: (14 hours) • Identification of different CCTV components • Draw, Trace or follow the CCTV setup of any commercial installation. • Identify the strategic locations for the installation of cameras. • Operate and learn the procedure for switching of cameras to have different views. • Identification of connectors and sockets used on DVRs • Test the healthiness cables and connectors. • Connect CCTV Cameras to DVR, Record and Replay. • Dismantle DVR and identify major functional blocks and test for the healthiness.	• Types of cameras and their specifications used in CCTV systems • CCTV Setup and its components Working of Digital Video Recorders and types of DVRs • Block diagram of DVRs (2 hours)
LCD and LED TV: (16 hours) • Identification and operate different Controls on LCD, LED TV • Identify various connectors provided on a LCD TV and test the healthiness. • Dismantling the panel of LCD/LED TV • Identification of components and different sector of LCD and LED TV • Dismantle and identify the parts of the remote control • Trace and rectify the faults of a various remote controls • Identify various connectors and connect the cable operator's external decoder (set top box) to the TV.	• Difference between a conventional CTV with LCD & LED TVs • Principle of LCD and LED TV and function of its different section. Basic principle and working of 3D TV • IPS panels and their features • Different types of interfaces like HDMI, USB, RGB etc with latest TVs. • TV Remote Control –Types, parts and functions, IR Code transmitter and IR Code Receiver, Working principle, operation of remote control. Different adjustments, general faults in Remote Control. (2 hours)
LCD/LED Projector (14 hours) • Identify various front panel controls on the given LCD/LED Projector and operate the projector using them • Identify rear connectors and terminate them using proper cables to the desktop	• Differentiate LCD and LED projectors • Specifications of LED Projector • Working principle of LED Projector • Most frequently occurring faults in a LED projector and their remedies (2 hours)

computer • Make necessary adjustment of the display using remote	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Workshop job
- Assembly and disassembly

SUBJECT CODE: CECE1-214
INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through firsthand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one-year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 20%
b) Industrial training report 50%
c) Presentation and viva-voce 30%

7. RESOURCE REQUIREMENT

7.1 LIST OF TOOLS/EQUIPMENT

a) TRAINEES TOOL KIT FOR 30 TRAINEES +1 INSTRUCTOR

Sr. No.	Names of the Items	Quantity
1.	Connecting screwdriver 100 mm	31
2.	Neon tester 500 V.	31
3.	Screw driver set (set of 5)	31
4.	Insulated combination pliers 150 mm	31
5.	Insulated side cutting pliers 150 mm	31
6.	Long nose pliers 150 mm	31
7.	Soldering iron 25 W. 240 V.	31
8.	Electrician knife	31
9.	Tweezers 100mm	31
10.	Digital Multimeter (3 ½ digit)	31
11.	Soldering Iron Changeable bits 10 W	31
12.	De- soldering pump	31

b) GENERAL MACHINERY SHOP OUTFIT

Sr. No.	Names of the Items	Quantity
1.	Steel rule 300mm	4
2.	File flat 200mm bastard	2
3.	File flat 200mm second cut	2
4.	File flat 200mm smooth	2
5.	100mm flat pliers	4
6.	100mm round Nose pliers	4
7.	Scriber straight 150mm	2
8.	Hammer ball pen 0.5Kg	1
9.	Allen key set (set of 9)	1
10.	Tubular box spanner (set of 6Nos)	1 set
11.	Magnifying lenses 75mm	2
12.	Hacksaw frame adjustable	2
13.	Scissors 200mm	1
14.	Handsaw 450mm	1
15.	Electric Drill Machine	2
16.	First aid kit	1
17.	Fire Extinguisher	2
18.	Bench Vice	1
19.	Dual DC regulated power supply 30-0-30 V, 2 Amps	4
20.	DC regulated variable power supply 0-24 V, 1Amp	2
21.	LCR meter (Digital)	1
22.	CRO Dual Trace 20 MHz (component testing facilities)	2
23.	Digital IC Tester	1
24.	Digital and Analog Bread Board Trainer	6

25.	Power Electronics Trainer with at least 6 no's of onboard applications	4
26.	Electronic circuit simulation software with 6 user licenses	1
27.	Soldering and de-soldering station	6
28.	SMD soldering and de-soldering station with necessary accessories	6
29.	MPS of different make	6
30.	UPS trainer	6
31.	LCD TV (Trainer Kit)	1
32.	LCD TV (21")	2
33.	LED TV (Trainer Kit)	1
34.	LED TV (21")	2
35.	Solar Power Inverter 500 VA	1
36.	LED/LED Projector	1
37.	Washing Machine (Semi-automatic machine)	1
38.	Washing Machine (Fully-automatic machine)	1
39.	Microwave Oven	1
40.	CCTV Cameras	3
41.	Digital Video Recorders	2
42.	Induction Cook-top	6
43.	DTH System	2
44.	SAT Meter	2
45.	Digital IC Tester	1
46.	Digital and Analog Bread Board Trainer	6

7.2 LIST OF CONSUMABLES

1.	Different types of electronic and electrical cables, connectors, sockets, terminations.	As required
2.	Different types of Analog electronic components, digital ICs, power electronic components, general purpose PCBs, bread board, MCB, ELCB	As required
3.	Different types of resistors	As required
4.	Different types of capacitors	As required
5.	Different types of inductors	As required
6.	Different types of transformers	As required
7.	Different types of transistors	As required
8.	Different types of diodes	As required
9.	Different types of FET	As required
10.	Different types of MOSFET	As required
11.	Different types of SCR	As required
12.	Different types of TIAC	As required
13.	Different types of TRIAC	As required

7.3 RECOMMENDED BOOKS

1. Principle of Electronics by V.K. Mehta; S Chand Publishers, Delhi..
2. Electronic Mechanic – NCVT Approved (Semester-wise) National Instructional Media Institute (NIMI), Chennai.
3. Electronic Mechanic by A.K. Mittal; Asian Publishers, Delhi.
4. Electronics Engineering by P.S. Jakhar; Dhanpat Rai Publishers,Delhi.
5. Fundamentals of Electrical Engineering and Electronics by B.L.Theraja; S Chand Publishers, Delhi.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.

2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.

3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.

4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.

5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.

6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

a) Following experts participated in the workshop to design curriculum of certificate programme in 'Servicing and Maintenance of Electronic Instruments' with NSQF alignment for MRSPTU, Bathinda on 27-28 June, 2016 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Professor & Head, Electronics and Communication Engineering Department and Director, College Development Council, MRSPTU Campus, Dabwali Road, Bathinda, Punjab
2.	Dr. Arun Kumar Singh, Associate Professor, PEC University of Technology, Sector-12, Chandigarh
3.	Shri Sanjeev Sharma, Hospital Engineer, Biomedical Division, PGIMER, Sector-14, Chandigarh
4.	Shri Jagdev Singh, HOD, ECE, Govt. Polytechnic College for Girls, Patiala
5.	Shri Manjit Singh Bhullar, HOD, ECE, Govt. Polytechnic College, Bathinda
6.	Shri Upendra Kumar, Sr. Technical officer, ISTE, CSIO, Sector-30, Chandigarh
7.	Shri Bhupesh Kumar, J.E. PGIMER, Sector-14, Chandigarh
8.	Mrs. Pankaj, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
9.	Shri Satnam Singh, Govt. Industrial Training Institute, Patiala, Punjab
10.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
11.	Shri Anil Kumar, Electronics Engineer, Electronics Service Centre, NITTTR, Chandigarh
12.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh **Coordinator**

b) Following experts participated in the workshop to design curriculum of certificate programme in 'Servicing and Maintenance of Electronic Instruments' with NSQF alignment for MRSPTU, Bathinda on 28 July, 2016 at NITTTR, Chandigarh.

1.	Mrs. Pankaj, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
2.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
3.	Shri Anil Kumar, Electronics Engineer, Electronics Service Centre, NITTTR, Chandigarh
4.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh **Coordinator**

c) Following experts participated in the workshop to review the curriculum of certificate programme in 'Servicing and Maintenance of Electronic Instruments' for MRSPTU, Bathinda on 20 January, 2017 at NITTTR, Chandigarh:

1.	Dr. MM Malhotra, Ex-Principal, TTTI, Chandigarh
2.	Shri Arvind Dixit, Advance Technology, Sector 24, Chandigarh
3.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU, Bathinda, Punjab
4.	Shri Kulmohan Singh, Ex-HOD, Electrical Engg., CCET (Diploma Wing), Sector 26, Chandigarh
5.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
6.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
7.	Shri Pritpal Singh Aulakh, GZSCCET, Bathinda
8.	Shri Naib Singh, Sr. Technician, GZSCCET, Bathinda
9.	Shri Jagdip Singh, , Sr. Technician, GZSCCET, Bathinda
10.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh **Coordinator**

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