Program Name : **Electronics Engineering Programme Group**

Program Code : **DE/EJ/ET/EN/EX/EQ**

Semester : **Fourth**

Course Title : **Consumer Electronics**

Course Code : **22425**

1. RATIONALE

In developing Nations demand of consumer electronic appliances is increasing day by day. This requires large number of technically trained man power in the relevant industries. Looking towards the present need, in-depth knowledge for maintaining various consumer electronics appliances/equipment is necessary for diploma engineering passout students. This course will introduce the students with working principles, of consumer electronics appliances like audio-video systems, microwave oven, washing machine, air-conditioner, camcorder and others to develop skills to troubleshoot in systematic way. Knowledge so gained would also help in production units of these consumer gadgets or help the students to start their own enterprises.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Maintain various consumer electronic appliances/equipments**.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following ***industry oriented*** COs associated with the above mentioned competency:

a. Troubleshoot different types of microphones and speakers.
b. Maintain audio systems.
c. Analyse the composite video signal used in TV signal transmission.
d. Troubleshoot colour TV receivers.
e. Maintain various consumer electronic appliances.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
				Theory							Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	2	5	3	70	28	30*	00	100	40	25@	10	25	10	50	20

(*): Under the theory PA, Out of 30 marks, 10 marks are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the cognitive domain LOs required for the attainment of the COs.

Legends: ***L****-Lecture;* ***T*** *– Tutorial/Teacher Guided Theory Practice;* ***P*** *- Practical;* ***C*** *– Credit,* ***ESE*** *- End Semester Examination;* ***PA*** *- Progressive Assessment.*

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

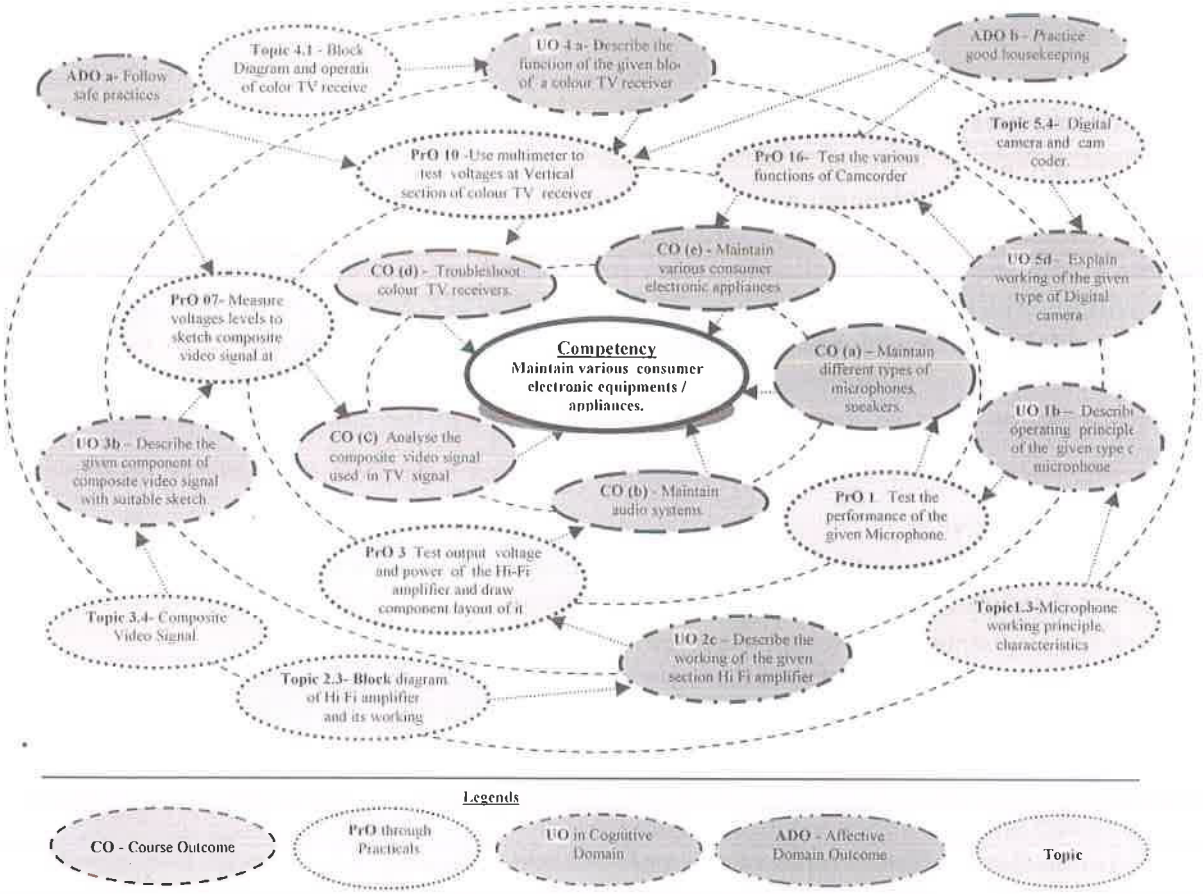

Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Test the performance of the given Microphone.	I	02
2	Test the performance of the given speaker.	I	02*
3	Test output voltage and power of the Hi-Fi amplifier.	II	02
4	Identify any three different faults by voltage analysis method for Hi-Fi Audio amplifier.	II	02*
5	Select exact speed to write a CD for given type of data.	II	02
6	Install/Test the CD for given type of data.	II	02
7	Measure voltage levels to sketch composite video signal at different stages of TV receiver.	III	02*
8	Use multimeter to measure voltage at various test points of colour TV receiver a) chroma section b) Picture Tube	IV	02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
9	Use multimeter to test various test points at Horizontal section of colour TV receiver.	IV	02
10	Use multimeter to test voltages at various points of vertical section of the colour TV receiver.	IV	02
11	Suggest the remedy for the Created fault and in the given colour TV trainer kit for the following faults a) No colour b) Red colour only c) Green colour only e) No sound.	IV	02*
12	Suggest the remedy for the following faults in given colour TV a) Fault in HSYNC section b) Fault in VSYNC section.	IV	02
13	Suggest the remedy for the following faults in colour TV a) Fault in SYNC separator b) Fault in video amplifier.	IV	02
14	Test the various sections of LED television receiver.	IV	02
15	Test the various sections of LCD television receiver.	IV	02
16	Test the various functions of Camcoder.	IV	02
17	Test the various features of the given type of printer.	V	02*
	Total		**34**

Note

i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicial mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.*

ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
1	Preparation of experimental set up	20
2	Setting and operation	20
3	Safety measures	10
4	Observations and recording	10
5	Interpretation of result and conclusion	20
6	Answer to sample questions	10
7	Submission of report in time	10
	Total	**100**

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

a. Follow safe practices
b. Practice good housekeeping
c. Practice energy conservation
d. Demonstrate working as a leader/a team member
e. Maintain tools and equipment
f. Follow ethical practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Digital Multimeter: 3.5 digit with R , V, I measurements	All
2	Cathode Ray Oscilloscope: Bandwidth : DC-30 MHz dual channel, Rise time: 12 ns approx Accuracy : ± 3 % Input Impedance : 1 Mohm	6,7,8
3	Digital Storage Oscilloscope. Bandwidth : 50/100MHz TFT Colour LCD Dual Channel Real Time Sampling: 1GS	6,7,8
4	Hi Fi amplifier system trainer	3
5	CD player trainer kit	4
6	Color TV receiver trainer kit	5,6,7,8
7	LED television receiver trainer kit	15
8	LCD television receiver trainer kit	16
9	Color Pattern generator	3-16
10	Camcoder.	17

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
UNIT-I Audio Fundamentals	1a. Differentiate between Mono and Stereo amplifier with respect to the given No. of speaker, No. of amplifiers, quality of sound and application. 1b. Describe the operating principles of the given types of microphones. 1c. Select the microphone for the given application. 1d. Explain with sketches the working principle of the given type of speaker. 1e. Describe the troubleshooting	1.1 Basic characteristics of sound signal: level and loudness, pitch, frequency response, fidelity, sensitivity and selectivity 1.2 Audio Amplifiers: Mono, Stereo 1.3 Microphone: working principle, and characteristics, Types: carbon, condenser, crystal, electrets and tie clip 1.4 Speakers: working principle and characteristics,Types: electrostatic, dynamic, permanent magnet etc., woofers, tweeter and mid range, wireless 1.5 Troubleshooting procedure.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	procedure of the given Microphone/speaker system.	
Unit-II Audio Systems	2a. Describe with sketches the given section of CD player. 2b. Explain with sketches the given mechanism of the give type of CD player with justification. 2c. Explain with sketches the working of the given section of Hi Fi amplifier. 2d. Describe working of the given section of PA system. 2e. Describe the troubleshooting procedure of the given section of the audio system.	2.1 Block diagram and operation of CD player, types of CD player 2.2 Component used for CD mechanism: CD pick-up assembly, gear system, drive motors, CD lens 2.3 Block diagram of Hi Fi amplifier and its working 2.4 Public Address (PA) system: Block diagram and operation, Speaker impedance matching and characteristics 2.5 Home theatre system 2.6 Troubleshooting procedure of audio systems. 2.7 Block diagram and working of MP3
Unit– III Television Fundamentals and Transmitter	3a. Explain with sketches the given type of scanning process. 3b. Describe with sketches the features of the given component of composite video signal. 3c. Explain with sketches the concept of the given type of modulation used in TV signal transmission with justification. 3d. Explain with sketches the given block of colour TV transmitter. 3e. Describe the troubleshooting procedure of the given section of the colour TV transmitter.	3.1 Concept: Aspect ratio, image continuity, interlaces scanning. scanning periods – horizontal and vertical, vertical and horizontal resolution 3.2 Vestigial sideband transmission, bandwidth for Colour signal, characteristics of colour signal, compatibility. 3.3 Colour theory, Grassman's law, additive and subtractive colour mixing Composite Video Signal – Pedestal height, Blanking pulse, colour burst, Horizontal sync pulse details, Vertical sync pulse details, equalizing pulses, 3.4 CCIR-B standards for colour signal transmission and reception, Positive and Negative modulation, merits and demerits of negative modulation 3.5 Block diagram of Colour TV Transmitter. 3.6 Troubleshooting procedure of Colour TV Transmitter
Unit– IV Television Receivers	4a. Describe with sketches the function of the given block of a colour TV receiver. 4b. Describe with sketches the function of the given section of PAL-D decoder. 4c. Compare the salient features of	4.1 Block diagram and Operation of color TV receiver 4.2 Operation of PAL-D decoder 4.3 HDTV: Development of HDTV, NHK MUSE System and NHK Broadcast 4.4 LCD/LED Technology: Principle and

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	the given types of TV display. 4d. Explain with sketches the functions of the given block of DTH receiver. 4e. Describe the troubleshooting procedure of the given section of the colour TV receiver.	working of LCD and LED TV 4.5 Direct to Home Receiver (DTH): Concept, receiver block diagram, Indoor and outdoor unit 4.6 Troubleshooting procedure of Colour TV Receiver systems. 4.7 Block diagram and working of OLED
Unit– V Consumer Electronic Appliances	5a. Explain with sketches the working of the given section of the photocopier machine with its specifications. 5b. Prepare specification of a Microwave oven for the specific applications. 5c. Explain with sketches the working of the given section of the given type of washing machine . 5d. Explain with sketches the working of the given type of Digital camera. 5e. Describe the troubleshooting procedure of the given office/ home appliances.	5.1 Photocopier block diagram, working 5.2 Microwave Oven: types, single chip controllers, block diagram, types, and wiring and safety instructions, electrical specifications 5.3 Washing Machine: Block diagram of washing machine, electrical Specifications, types of washing machine: Automatic, semi automatic 5.4 Digital camera and cam coder: pick up devices, picture processing, and picture storage electrical specification. 4.8 Troubleshooting procedure of Colour TV Receiver systems.

***Note**: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'*

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Audio Fundamentals	06	02	04	02	08
II	Audio Systems	08	04	04	04	12
III	Television Fundamentals and TV Transmitter	10	06	06	04	16
IV	Television Receivers	12	04	06	04	14
V	Consumer Electronic Appliances	12	04	04	12	20
Total		**48**	**20**	**24**	**26**	**70**

***Legends:** R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)*
***Note**: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a. Prepare the survey report on the specifications and applications of different types of Microphone and speaker.
b. Conduct market survey for latest home applications and compare specifications of reputed brands and prepare a report.
c. Make visit to service center of electronic gadgets.
d. Follow the safety precautions.
e. Use various meters to test electric/electronic equipment and component.
f. Library / Internet survey of electrical circuits and network
g. Prepare power point presentation or animation for understanding different circuits behavior.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. ***'L' in item No. 4*** does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
c. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e. Guide student(s) in undertaking micro-projects.
f. Demonstrate students thoroughly before they start doing the practice.
g. Encourage students to refer different websites to have deeper understanding of the subject.
h. Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects are given here. Similar micro-projects could be added by the concerned faculty:

a. **Battery charger:** Build a Battery charger for mobile phone. Prepare a report.
b. **FM Radio Receiver**: Build FM radio receiver using IC TEA5591.
c. **Installation of DTH**: Install DTH indoor and outdoor unit.
d. **Up Down counter**: Build a circuit for 2digit Up Down counter at gates of a mall/Parking space.Prepare a report.
e. **Timer delay** : Build a Timer delay using IC 89c51
f. **Gas leakage detector:** Develop a circuit for LPG gas leakage detector. Prepare a report.
g. **Smoke detector**: Build a Smoke detector circuit for office/hospitals. Prepare a report.
h. **Light ON OFF control**: Develop a circuit for Light ON OFF control using mobile app and Bluetooth. Prepare a report.
i. **Temperature controller: Temperature** controller using microcontroller. Prepare a report.
j. **PA system**: Develop a PA system for small conference hall.
k. **Bar code reader**: Build a Bar code reader circuit for super market/library.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Consumer Electronics	Bali, S.P.	Pearson Education India, Delhi, 2007; ISBN: 9788131717592
2	Audio video systems principles, maintenance and troubleshooting	Gupta, R.G.	Mc graw Hill, New Delhi, India 2010, ISBN: 9780070699762
3	Audio video systems : principle practices and troubleshooting	Bali, Rajeev ; Bali, S.P.	Khanna Book Publishing Co. (P) Ltd., 2014 Delhi , ISBN:9788187522058
4	Modern Television Practice: Transmission, Reception and Applications	Gulati, R.R.	New Age International, New Delhi Year 2015, ISBN: 978-81-224-3784-3
5	Television and video Engineering	Dhake, A.M	McGraw- Hill, New Delhi, India 2006, ISBN: 0-07-460105-9

14. SUGGESTED SOFTWARE/LEARNING WEBSITE

a. Microphone:-\https://www.coursehero.com/file/18404103/7-Microphonesppt/
b. CD player: www.tclauset.org/cpg132/albums/FTPupLoads/PPT_05/CDs_SperosS.ppt
c. Microwave oven: www.calvin.edu/~pribeiro/courses/engr302/Samples/Microwave.ppt
d. www.sharpthai.co.th/backoffice/img/download.../ES-D159T-SLWH%20ENG.pdf
e. Photocopier machine:www.youtube.com/watch?v=NxUbPE8RsiM
f. Microwave :-www.slideshare.net/fascinating/microwaves-presentation
g. Television: https://www.slideshare.net/PravinShirke07/colour-television
h. Colour TV theory: https://www.slideshare.net/slhallman/color-theory-533704