Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title **: Applications of Electronics Engineering**	Course Code: **15EC54T**
Semester : **5**	Course Group: **Core**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**	Credits : **4**
Type of course: **Lecture + activity**	Total Contact Hours: **52**
CIE : **25 Marks**	SEE : **100 Marks**

Prerequisites

Basics concepts of electronics, communications and computers.

Course Objectives

1. Know penetration of electronics applications in various fields of society.
2. Appreciate influence of electronics in entertainment, consumer, automobile and robotic applications
3. Select an application/area for professional career

Course Outcomes

On completion of the course, students will be able to:

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand the role of electronics in consumer applications	**R/U/A**	2	8
CO2	Understand the importance of electronics in automobile applications	**R/U/A**	3	10
CO3	Understand various electronic audio systems	**R/U/A**	2	6
CO4	Understand various electronic video systems	**R/U/A**	2	8
CO5	Identify the electronic equipments for entrainment applications	**R/U/A**	4	8
CO6	Understand the basics and working of different elements of robotics	**R/U/A /C**	2	12
	Total sessions including 6 hrs student activity			**52**

Legends: PO-Program Outcome, CO-Course Outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply, A-Analyze, C-Create

Mapping Course Outcomes with Program Outcomes

Course Outcomes	Programme Outcomes									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	*	*	--	--	*	*	*	--	*	*
CO2	*	*	*	*	--	--	--	--	*	*
CO3	*	*	*	--	--	--	--	--	*	*
CO4	*	*	*	--	--	--	--	--	*	*
CO5	*	*	*	*	--	--	--	--	*	*
CO6	*	*	*	*	*	--	*	--	*	*

***Legend**: * Linked, -- No link*

Course-Po Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Applications of Electronics Engineering	**-**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**

***Legend**: Addressing levels: 1-Slight, 2-Moderate, 3-Substantial, -- Not addressed*

***Quantification Method:** This is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3; if 25 to 40% , Level 2; if 5 to 25%, Level 1; and if < 5%, not addressed.*

Course content and pattern of marks for SEE

Unit No	Unit Name	Hour	Questions to be set For SEE					Marks Weightage	Weightage (%)
			R	U	A	E	An		
1	Consumer electronics	10	05	10	10			25	19
2	Automobile electronics	10	05	10	10			25	19
3	Audio systems	6	05	5	10			20	12
4	Video systems	6	05	5	10			20	12
5	Entertainment electronics	8	05	05	10			20	15
6	Robotics	12	05	10	20			35	23
	Total	**52**	**30**	**45**	**70**			**145**	**100**

Legend: R- Remember, U-Understand A-Application E-Evaluation, An-Analyse

Course Content

Unit-1: Consumer electronics Duration: 8hrs

Calculator – Structure of a calculator, internal organisation of a calculator.

Microwave oven- Principle of microwave cooking, Block diagram, Types.

Washing machine- Electronic controller of washing machines, Concept of Fuzzy logic and its application in washing machine.

Air conditioners- Air conditioning, Remote controlled air conditioner. Comparison of Barcodes and QR codes.

Refrigeration-Role of electronics.

Office automations: Features of copiers, scanners and printers.

Unit-2: Automobile electronics Duration: 10hrs

Need of Electronics in Automobiles, Electronic ignition, electronic ignition lock system, Anti brake system (ABS), Electronically controlled suspension, Instrument panel displays, Ultrasonic car safety belt system, vehicle proximity detection system, Air-bag system, Vehicle navigation, theft detection and remote locking, solar automobiles.

Unit-3: Audio systems Duration: 6hrs

Terminology in audio systems: Audio signal**,** amplifier, bass control, treble control and decibel.

Microphone- Principle of operation, types and features of microphones.

Headphones- Principle of operation, types and features of Headphones.

Loudspeakers- Features of Basic loud speaker, Crystal loudspeaker and woofers.

Unit-4: Video systems **Duration: 8hrs**

Features of Digital camera, Cam coder and TV camera. Color Television- Terminology and block diagram of TV communication system. Features of TV Transmitter and receiver. Features of video/TV Displays– CRT, PLASMA, LCD, LED, HDTV and Touch screens. Features of Smart-TV.

Unit-5: Entertainment electronics **Duration: 8hrs**

Concept of Interactive video system. Features of video gaming systems. Features of LCD projectors and 3D glasses. Concept of Virtual reality and its applications. Identification of electronic instruments for musical applications. Concept of Electronic music synthesizers and their applications**.** Concept of music & video editing and mixing.

Unit-6: Robotics **Duration: 12hrs**

Robot- Definition, Advantages and disadvantages, Functions and Applications.
Control system- Definition, classification – Open-loop and closed-loop systems, Automatic control system.
Components of Robotic system - Manipulator arm, end-effectors (gripper), Actuators and transmissions, Controller, Sensors, Basic motions / degrees of freedom.
Robot Classification–Based on generation, power-type and applications.
Robot qualities- Tactile sensing, Vision and Mobility.
Robot Control systems- Non- servo control and Servo control.
Robotic sensor classification: Internal-state sensors and External-state sensors, tactile and non-tactile sensors.
Robotic vision system- Functions, components of vision system.
Actuators- Definition and features of Electrical actuators, Switching devices (Mechanical and solid state), Drive systems (D.C motors, A.C motors and stepper motors).

References

1. S P Bali, “Consumer Electronics”, Pearson Publishers
2. Tom Denton, “Automobile Electrical and Electronic Systems”. 3rd edition.
3. William. B. Ribbens, “Understanding Automotive electronics”
4. R.K. Rajput, “Robotics and Industrial automation”, S . Chand & Co
5. Web resources (dynamic)
   a) http://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/lecture-notes/chapter3.pdf
   b) https://www.engineeringforchange.org/uploads/activity/147/147/396/1316201555863/low_cost_projector.pdf

Suggested Student Activities **Duration: 4hrs**

***Note*: The following activities or similar activities for assessing CIE (IA) for 5 marks (Any one) Refer CIE pattern**

Institutional Activities

Sl. No.	Activity
1	Organize Seminar, workshop or Lecture from experts on the modern trends in Robotics and Usage of electronic devices in industries.
2	Organize workshop to develop and demonstrate an electronic application.
3	Organize a hands-on workshop to develop a mini project.

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools. Usage of specific animated videos or demonstration videos from YouTube link is preferable.

Course Assessment and Evaluation Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests+	20	Blue Books	1 to 6
				Activity*	05	Activity Sheets	1 to 6
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 & Delivery of course
	End of course survey			End of the Course	Nil	Question-naires	1 to 6, Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

+ Every I.A. test shall be conducted for 20 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

***S**tudents should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term and assessed through appropriate Rubrics.

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	40
4	Evaluate	06
5	Create	04
	Total	**100**

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE (IA) marks

Activity
1. Prepare a report on role of electronics in Aeronautics. 2. Prepare a report on Internet of Things (IOT) (smart automobile, smart home, smart city, Smart Villages, Smart hospitals) 3. Prepare a report on role of electronics in Agriculture 4. Identify at least any ten electronics applications which are not covered in this course and list their features. 5. Prepare a report of features and functioning of electronics voting machine 6. Identify at least any ten electronics applications which are not covered in this course and list their features **Execution Mode** 1. Maximum of 4 students in each batch for student activity. 2. All the above activities need to be distributed evenly to the students based on their interest. 3. For each batch, assign any one activity among 1 to 5; activity 6 is compulsory for all batches. 4. Write qualitative report of 4 to 6 pages; one report per batch. 5. Activities can be carried out off-class. 6. Teacher is expected to observe and record the progress of students' activities; Assessment shall be made based on the following rubrics table

(ii) Model of rubrics for assessing student activity

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Information search and documentation	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listening skills	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
					Total marks	ceil(13/4) = 4

(iii) CIE/IA Tests (20 Marks)

Three tests have to be conducted in accordance with the test pattern given below and average marks of them are considered for CIE/IA with specified schedule.

(iv) Format of CIE/IA test question paper

CIE Question Paper								
Institution Name and Code								
Course Co-ordinator/Teacher								
Program Name			***Test No.***		*Units*			
Class/Sem			*Date*		*CL*			
Course Name			*Time*		*COs*			
Course Code			*Max. Marks*		*POs*			
Note to students: Answer all questions								
Question No.	**Question**			Marks	**CL**	**CO**	**PO**	
1								
2								
3								
4								

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Note: Internal choice may be given in each CO at the same cognitive level (CL).

(v) Model question paper for CIE

CIE Question Paper								
Institution Name and Code								
Course Co-ordinator/Teacher								
Program Name	Electronics & Communication		***Test No.***	1	*Units*	1 & 2		
Class/Sem	5^{th} Sem		*Date*	1/1/2017	*CL*	R/U/A		
Course Name	Applications of Electronics Engineering		*Time*	10-11AM	*COs*	1 & 2		
Course Code	15EC54T		*Max. Marks*	20	*POs*	1, 2 & 3		
Note to students: Answer all questions								
No.	**Question**			Marks	**CL**	**CO**	**PO**	
1	List the applications of latest Xerox machines. OR Write the block diagram of Washing machine.			05	R/A	1		
2	List the different available electronic gadgets with their applications.			05	U	1		
3	Explain anti break system. OR List the needs of electronics in automobile.			05	R/U	2		
4	Analyze the block diagram of vehicle navigation.			05	A	2		

Semester End-exam Evaluation (SEE)

(i) End-exam question-paper pattern

.Unit No.	Unit Name	Study Duration (Hrs.)	No. Questions for End-exam	
			5 marks Part - a	10 marks Part - b
I	Consumer electronics	8	1	2
II	Automobile electronics	10	1	2
III	Audio systems	6	2	1
IV	Video systems	8	2	1
V	Entertainment electronics	8	2	1
VI	Robotics	12	1	3
	Total	**52**	**09 (45 Marks)**	**10 (100 Marks)**

(ii) Model question paper

Course Title **: Applications of Electronics Engineering**

Course Code **: 15EC54T** Time **: 3 Hrs**

Semester **: 5** Max. Marks**: 100**

Instructions*: 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)*

*2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)*

Part A

1. List the applications of latest copier machines.
2. Compare calculator and computer.
3. Explain electronic ignition in automobile engines.
4. List different types of microphones, headphones and loudspeaker.
5. Compare various types of microphones.
6. Write a note on smart TV.
7. Mention at least five electronic musical instruments.
8. Define robotics and list applications of ROBOT.
9. List and briefly explain any one robotic sensor.

Part B

1. a) Evaluate the importance of microwave oven in bulk-cooking system like hotels/bakeries.
   b) Enumerate the consumer electronics applications
2. With block diagram, explain vehicle proximity detection system.
3. Explain the following.
   a. ABS
   b. Remote lock
4. a) Explain the importance of electronics in automobile with example.
   b)
5. Compare touch screen based electronic gadget with smart TV.

6. Compare LED, LCD, HDTV.
7. Compare basic loudspeaker and crystal loud speaker.
8. Explain the technology behind the virtual reality.
9. With relative diagram explain degrees of freedom.
10. Analyse the non-servo control system and servo control system in robotic applications.

Model Question Bank

Course Title : **Applications of Electronics Engineering**	Course Code: **15EC54T**

Unit-1
Consumer electronics

5-marks question

Remember

1. Mention any 10 consumer electronic goods
2. List different microware devices and their applications
3. Write the block diagram of Washing machine
4. Write the block diagram of Air condition system
5. Write the block diagram of Refrigeration
6. List the applications of latest Xerox machines

Understand

1. Explain internal organization of calculator
2. Explain the working principle of microwave device
3. Explain the working principle of washing machine
4. Importance of refrigeration in home and dairy-industry, explain.
5. Explain the working principle of Xerox machine
6. List the applications of bar-coding.

Application

1. With an example explain how calculator works

Analyze

1. Analyze the block diagram of microwave oven with its working principle

Create

1. Prescribe the required electronic component to design a calculator

10-marks question

Remember

1. List the different available electronic gadgets with their applications

Understand

Application

1. Mention and justify an electronic machine which helps to clean the cloths

Analyse

1. Evaluate the importance of microwave oven in bulk-cooking system like hotels/bakeries.

Create

1. Prescribe the required electronic component to design a scientific calculator and explain the importance of each components.

Unit-2
Automobile electronics

5-marks question

Remember

1. List the needs of electronics in automobile
2. Write the block diagram of vehicle proximity detection system and mention its various blocks.

Understand

1. Explain electronic ignition
2. Explain anti break system
3. Explain air bag system in automobile

10-marks question

Remember

1. List different blocks in electronically controlled automobile vehicle and explain.

Understand

1. Explain working principle of ABS system with block diagram
2. Explain the following.
   a. Electronic ignition
   b. ABS
   c. Electronically controlled subsystem
3. Explain the concepts of car safety using electronics

Apply

1. Analyse the block diagram of vehicle navigation
2. Explain the importance of electronics in automobile with example

Unit-3
Audio systems

5-marks question

Remember

1. List different types of microphone, headphone and loud speaker
2. Mention any 5 characteristics of microphone

Understand

1. Explain how basic loud speaker works

10-marks question

Understand

1. With relative diagram explain any two microphone
2. Compare basic loudspeaker and crystal loud speaker

Unit-4
Video systems

5-marks question

Remember

1. List image/video capturing and displaying electronic devices
2. Draw the block diagram of colour TV and mention its block
3. Write a note on smart TV

Understand

1. Explain how digital camera works
2. With neat block diagram explain television
3. Compare LED, LCD,HDTV
4. With an example explain how smart TV works.

10-marks question

Understand

1. With neat block diagram explain working of colour TV
2. Compare touch screen based electronic gadget with smart TV

Unit-5
Entertainment electronics

5-marks question

Remember

1. Mention electronic musical instruments
2. Write a note on electronic guitar
3. Mention the applications of virtual reality

Understand

1. Explain how interactive video system works
2. Explain the working of LCD Projector
3. How electronic guitar works, explain
4. Write a note on electronic wind instrument

10-marks question

Remember

1. Mention and explain different electronic music synthesiser
2. Explain the technology behind the virtual reality

Unit-6
Robotics

5-marks question

Remember

1. Define robot and list its functions
2. List the qualities of robot
3. List different robotic sensors
4. Write a note on robotic vision system
5. Define actuators. List its different parts
6. Define control system and list different robotic operation

Understand

1. Explain the importance of robots in this present word
2. List the advantage and disadvantage of robots
3. List and explain different robotic sensors
4. How actuator works explain the relative diagram

10-marks question

Remember

1. List and explain robotic qualities
2. Explain the components of robotic system

Understand

1. Explain working of
   a. Pick and place robot
   b. Line follower robot
2. Briefly explain robotic vision system and its application in industries
3. With relative diagram explain degrees of freedom

Apply

1. Analyse the working of pick and place robot in industrial application with example.
2. Analyse the non servo control system and servo control system in robotic applications.