

EC-105–BASIC ELECTRONICS

Course Title:	Basic Electronics	Course Code	EC-105
Year	I	Course Group	Core
Teaching Scheme in Periods (L:T:P)	4:1:0	Credits	3.0
Methodology	Lecture+ Tutorials	Total Contact Periods	150

Pre-requisites:

Basic knowledge of physics, mathematics, AC, DC voltages and currents.

Course Outcomes: Upon completion of the course, the students shall be able to

CO1	Comprehend various Passive components (resistors, capacitors and inductors) used in electronic circuits.
CO2	Solve basic electrical circuits
CO3	Comprehend AC fundamentals
CO4	Use of basic electronic instruments in measurements
CO5	Comprehend the working of Diode, BJT and rectifiers.
CO6	Comprehend the working of FETs and MOSFETs.

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
I	Passive components	30	Q4	Q1		Q9(a)	Q13(a)
II	Energy sources & star delta networks.	20					
III	AC fundamentals	20		Q2		Q10(a)	Q14(a)
IV	Basic Electronic Instruments	30					
V	Diode, BJT and Rectifiers	30		Q3	Q5, Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI	FETs and MOSFETs	20					
	Total	150	8		8	8	

Course Content

Unit-1: Passive components Duration:30 Periods(L:25–T:5)

Colour coding of resistors, classification-solve problems on series & parallel combination, applications, specifications, different types of capacitors-specifications -importance- series and parallel connection applications-colour coding, losses and faults. Different types of inductors-specifications -importance-applications. Coefficient of coupling, Self-inductance and mutual inductance, simple problems on inductors, need of transformer, working principle of transformer, applications of transformer.

Switches, Fuses & relays

Working of a switch, switches according to poles and throws (SPST, SPDT, DPST, DPDT, Multi-pole multi-throw

need of fuse in electronic equipment, types of fuses, metals used for fuses, significance of fuse ratings, need for connectors in electronic circuits, types of connectors, use of MCB. Electromagnetic relay, working of a relay, applications of relays

Unit-2 Energy sources & star delta networks.

Duration: 20 Periods (L:15–T:5)

Ohm's Law, KVL and KCL, ideal voltage source, ideal current source, practical voltage and current sources, source transformation techniques, problems related to source transformation, star and delta networks, formulae for star to delta conversion, formulae for delta to star conversion, problems related to star delta networks.

Unit 3- AC fundamentals. Duration: 20 Periods (L:15– T:5)

DC and A.C voltage, sine wave and concept of a cycle, Time period , Frequency and Amplitude of a sine wave , formula for the instantaneous value in terms of maximum value, frequency and time, different forms of emf equation, simple problems to calculate Amplitude, frequency and Time Period, average value, R.M.S. value, form factor and peak factor for sine wave, phase and phase difference, concept of Leading , lagging and in phase with the help of waveforms.

Unit-4 Basic Electronic Instruments Duration:30 Periods (L:20– T:10)

Instruments used to measure different parameters like voltages and currents, measurement of frequency and amplitude of different types of waveforms, working of CRO, LCR meter, Q meter, Function generator, multimeter, advantages of digital instruments, instruments used to measure biological parameters, transducers.

Unit-5 Diode, BJT and Rectifiers.

Duration:30 Periods (L:28– T:2)

Intrinsic and Extrinsic Semiconductors (P, N types), PN diode- working-biasing-V I characteristics- applications and specifications- Zener diode- advantages- working and VI characteristics- different types of transistors- symbols, working of NPN transistor and PNP transistor- different transistor configurations- circuit diagram of CB, CE and CC configurations- cut-off, saturation and active regions- alpha, beta and gamma factors, relation between alpha and beta, alpha and gamma, beta and gamma-expression for collector current in CE configuration, Compare the different configurations

Rectifiers

Necessity of DC power supply in electronic circuits- block diagram of a regulated power supply- function of each block- types of rectifiers- working of half wave rectifier- the input and output waveforms of HW and FWR- working of full wave rectifier- working of bridge rectifier- input and output waveforms of BR- need for a filter- different types of filter circuits- ripple factor, peak inverse value and efficiency-values for each rectifier

Unit-6 FETs AND MOSFETs

Duration:20 Periods (L:18– T:2)

Different types of FETs- construction -symbols -terminals -working of JFET- drain and mutual characteristics -parameters of JFET- relation between parameters -specifications & applications of JFET- Distinguish between BJT and FET- advantages - disadvantages of FET over BJT.

Different types of MOSFET- symbols, differences between FETs and MOSFETs. -advantages of MOSFETs- construction & working of depletion and enhancement MOSFET- Distinguish between enhancement and depletion MOSFET.

Reference Books

- Electrical Technology vol.1:B L Teraja
- Basics of electronics : V.K.Mehta

Suggested E-learning references

- b) <https://www.pearsonhighered.com/assets/samplechapter/0/1/3/2/0132859610.pdf>
- c) www.electronics-tutorials.ws
- d) www.nptel.ac.in

Suggested E-learning references

Upon completion of the course, the student shall be able to

CO1: Know various Passive Components

- 1.1 Define Resistance and classify resistors.
- 1.2 List the specifications of a resistor, and state their importance.
- 1.3 Explain the necessity of preferred values in resistor.
- 1.4 Identify Resistance Value by using Colour coding Resistors. (4 band and 5 band).
- 1.5 List the common faults in resistors.
- 1.6 List the types of Variable resistors.

- 1.7 Draw the European and US standard symbols of Potentiometers and Presets.
- 1.8 Compare the features of carbon and wire wound potentiometers.
- 1.9 List applications of carbon and wire wound potentiometers.
- 1.10 Define the terms specific resistance and conductivity.
- 1.11 Deduce the relation $R = (\rho l) / a$
- 1.12 Solve simple problems using the above formula.
- 1.13 Solve simple problems on Series and parallel connections of Resistances.
- 1.14 Explain the effects of temperature on resistance
- 1.15 Derive the formula $R_t = R_o (1 + \alpha_o t)$ to find resistance at any given temperature
- 1.16 Solve Simple problems using the above formula.
- 1.17 Define Capacitance and classify capacitors.
- 1.18 List the specifications of a capacitor and state their importance.
- 1.19 Identify Reading of capacitor value and tolerance by 1. Colour code. 2.Value printed.
- 1.20 State the factors affecting the capacitance of a capacitor.
- 1.21 List different types of variable capacitors and mention their applications.
- 1.22 Explain the use of ganged capacitor in AM radio for tuning.
- 1.23 Define Inductance and classify inductors and draw their symbols.
- 1.24 List the specifications of inductors.
- 1.25 List various core materials used in the construction of inductors.
- 1.26 List the applications of A.F. and R.F chokes.
- 1.27 Define Transformer
- 1.28 Explain the principle of Transformer and its use.
- 1.29 Define Self Inductance, Mutual Inductance, coefficient of coupling
- 1.30 Deduce the relation between Mutual Inductance, coefficient of coupling
- 1.31 Classify switches according to poles and throws (SPST, SPDT, DPST, DPDT, Multi- pole multi-throw).
- 1.32 Explain the need of fuse in electronic equipment, its types and metals used for fuses.
- 1.33 Define electromagnetic relay.
- 1.34 List the different types of relays based on principle of operation, polarization.
- 1.35 Explain the working of a relay with a neat diagram.
- 1.36 List the applications of relays in electronic circuits.

CO2: Solve basic electrical circuits.

- 2.1 Define Ohm's Law.
- 2.2 Write different forms of Ohm's Law and solve simple problems on it.
- 2.3 Define KVL and KCL.
- 2.4 Solve simple problems using KVL and KCL for DC Circuits.
- 2.5 Define ideal voltage source
- 2.6 Define ideal current source
- 2.7 Explain practical voltage and current sources
- 2.8 Explain source transformation techniques
- 2.9 Solve simple problems related to source transformation
- 2.10 Draw star and delta networks
- 2.11 Write the transformation formulae for star to delta conversion
- 2.12 Write the transformation formulae for delta to star conversion
- 2.13 Solve problems related to star delta networks

CO3: Comprehend AC Fundamentals.

- 3.1 Define the terms DC and A.C voltage

- 3.2 Draw the sine wave and explain the concept of a cycle
- 3.3 Define Amplitude, Time period, Frequency and Phase of a sinewave
- 3.4 Give the formula for the instantaneous value in terms of maximum value, frequency
- 3.5 Write different forms of emf equation.
- 3.6 Solve simple problems to calculate Amplitude, frequency and Time Period
- 3.7 Define the average value, R.M.S.value, form factor and peak factor for sine wave.
- 3.8 Explain the phase difference.
- 3.9 Explain the concept of Leading, lagging and in phase with the help of waveforms.

CO4: Comprehend the basic electronic instruments.

- 4.1 List various electronic instruments.
- 4.2 Distinguish Analog and digital instruments.
- 4.3 Know the advantages of digital instruments.
- 4.4 Explain the working of analogue multimeter.
- 4.5 List the applications of Analog and Digital multi-meters.
- 4.6 Draw the block diagram of CRO and know its operation.
- 4.7 Explain how CRO is used to measure amplitude and frequency.
- 4.8 Explain the operation of LCR meter.
- 4.9 Explain the operation of Q meter.
- 4.10 Explain the working of RF function generator.
- 4.11 List the instruments used to measure various biological parameters.
- 4.12 What is a transducer and know its need.
- 4.13 List the important types of electrical transducers.

CO5: Comprehend the working of PN Diode, BJT and Rectifiers.

- 5.1 Know about Intrinsic and Extrinsic Semiconductors (P, N type).
- 5.2 Explain formation and working of PN diode under no bias, forward bias and reverse bias conditions.
- 5.3 Draw and explain the V-I Characteristics of PN Diode.
- 5.4 List the specifications and applications of semiconductor diode.
- 5.5 Explain the working principle of Zener diode.
- 5.6 Identify the difference in the construction of Zener from semiconductor diode.
- 5.7 Explain the V-I characteristics of Zener Diode.
- 5.8 List the different types of transistors.
- 5.9 Explain the working of NPN/ PNP transistors.
- 5.10 Know various Transistor Configurations (CB, CE and CC) and draw their circuits.
- 5.11 Know cut-off, saturation and active regions with their biasing conditions.
- 5.12 Draw the input and output characteristics of CE configuration.
- 5.13 Define alpha, beta and gamma factors.
- 5.14 Derive the relation between alpha and beta.
- 5.15 Derive the relation between alpha and gamma.
- 5.16 Derive the relation between beta and gamma.
- 5.17 Derive the expression for collector current in CE configuration.
- 5.18 Compare the different configurations of transistors.
- 5.19 Explain the necessity of DC power supply in electronic circuits.
- 5.20 Draw the block diagram of a regulated power supply and explain the function of each block.
- 5.21 Explain the working of half wave rectifier with input and output waveforms.
- 5.22 Explain the working of full wave rectifier with input and output waveforms.
- 5.23 Explain the working of bridge wave rectifier with input and output waveforms.

- 5.24 Identify the need for a filter.
- 5.25 Classify the different types of filter circuits.
- 5.26 Define ripple factor, peak-inverse voltage and efficiency and know their values for HW, FW and Bridge rectifiers.

CO6: Comprehend the working of JFETs and MOSFETs

- 6.1 Classify different types of FETs.
- 6.2 Explain the construction and working of JFET.
- 6.3 Explain the drain and mutual characteristics of FET.
- 6.4 Define various parameters of JFET and establish the relation between them.
- 6.5 List the specifications and applications of JFET.
- 6.6 Distinguish between BJT and FET.
- 6.7 Define MOSFET.
- 6.8 Know the differences between FETs and MOSFETs.
- 6.9 Classify different types of MOSFETs.
- 6.10 Draw the symbols of MOSFETs and identify their terminals.
- 6.11 Explain the construction and working of depletion MOSFET.
- 6.12 Draw the characteristics of depletion MOSFET.
- 6.13 Explain the construction and working of enhancement MOSFET.
- 6.14 Draw the characteristics of enhancement MOSFET.
- 6.15 Distinguish between enhancement and depletion MOSFET.

Suggested Student Activities

Visit the Institute's Library / internet centre and list the books / journals/e-books and any other resources available on the topics suggested by the teacher.

Prepare a chart showing the symbols and names of various devices.

Prepare a PPT identifying the need for these semiconductor devices and their use in electronic industry.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	Linked PO
CO1	2			1				1,
CO2	2	2	1	1		1		1,3,4,6
CO3	2	2	1	1		1		1,3,4,6
CO4	2	2	2	1		1		1,3,4,6
CO5	2		2	1		2	1	1,3,4,6,7
CO6	2		3	1		2	1	1,3,4,6,7

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marksfor each question	Choice	Total Marks
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01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
TotalMarks						40 Marks

Unit No	QuestionstobesetforSEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5, Q6	Q9(b), Q11(a),Q11(b)	Q13(b), Q15(a),Q15(b)
VI					
TotalQuestions	8		8	8	

State Board of Technical Education and Training, Telangana Model Question paper

DECE I semester

Mid Semester-I Examination

Course Code: EC-105

Duration:1 hour

Course Name: Basic Electronics.

Max.Marks:20 Marks

PART-A

Answer all questions, 4x1= 4 Marks

- 1) Define conductivity.
- 2) Define Self Inductance.
- 3) Draw the symbol of SPST and DPST switches.
- 4) List 2 applications of fuses.

PART-B

Answer TWO questions.

2x3=6 Marks

5a) Compare the features of carbon and wire wound potentiometers.

(OR)

5b) Derive the expression for co-efficient temperature of resistance.

6a) Explain the working of electro-magnetic relay.

(OR)

7a) Explain the transformation formulae for delta to star network.

PART-C

Answer TWO questions. 2x5=10Marks

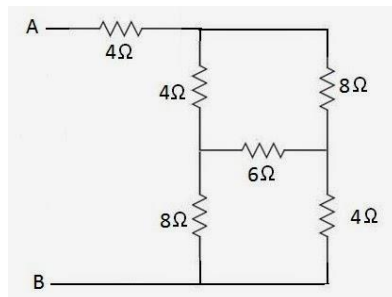
8a) Determine the value of 2 resistors. When connected in parallel equivalent is 6 ohms and when in series is 16 ohms.

(OR)

8b) Explain KVL and KCL

9a) Explain the working principle of transformer.

(OR)



9(b) Find the equivalent resistance between A & B in the given network.

State Board of Technical Education and Training, Telangana

Model Question paper

DECE I semester Mid Semester-II Examination

Course Code: EC-105

Duration: 1 hour

Course Name: Basic Electronic

Max. Marks: 20 Marks

PART-A

Answer ALL questions,

4x1= 4 Marks

- 1) Define amplitude and frequency of sine wave.
- 2) Write the standard form of emf equation.
- 3) What is the advantage of digital instruments?
- 4) Define various biological parameters.

PART-B

Answer TWO questions.

2x3= 6 Marks

5a) Determine the amplitude, frequency, phase, in the given equation

$$V = 50 \sin (\omega t + \pi/6) \text{ volts.}$$

(OR)

5b) Define form factor and peak factor.

6a) List the front panel controls of CRO.

(OR)

6 b) Define transducers and list any 3 of them.

PART-C

Answer TWO questions.

2x5= 10 Marks

7a) Explain the leading and lagging phase with waveforms.

(OR)

7b) Determine sum of the 2 vectors $v_1 = 10 \sin \omega t$ and $v_2 = 50 \sin (\omega t + \pi/6)$

8a) Explain the working of analog multimeter.

(OR)

8b) Explain the use of LCR meter and Q meter.

DECE I semester End Examination

Course Code:EC-105

Duration: 2 hours

Course Name: Basic Electronics

Max.Marks:40 Marks

PART-A

Answer all questions.

8x1= 8 Marks

- 1) State the factors affecting the value of capacitance.
- 2) Define time period of alternating quantity.
- 3) Draw the symbol of NPN and PNP transistor.
- 4) Write the relation between alpha and beta.
- 5) State the need for a filter.
- 6) List any 2 applications of PN diode.
- 7) Draw the symbol of n-and p -channel FET.
- 8) Write any 2 advantages of JFETs.

PART-B

Answer FOUR questions.

4x 3 = 12 Marks

9a) Determine the value of equivalent resistance when two equal resistors are connected in parallel.

OR

9b) Define co-efficient of coupling and mutual inductance.

10A) Explain the working of CRO.

(OR)

10 B) Write any three advantages of digital instruments.

11 a) Derive the expression for collector current in CE configuration.

(OR)

11 b) Draw the input and output characteristics in CB configuration.

12 a) Derive the relation $\mu = g_m r_d$

(OR)

12 b) Draw the drain characteristics of JFET.

PART-C

Answer FOUR questions.

4x 5 = 20 Marks

13(a) Explain any 5 specifications of resistors.

(OR)

13(b) Explain the working of NPN transistor.

14(a) Explain the working of electromagnetic relay.

(OR)

14(b) Compare the 3-transistor configuration.

15(a) Write any 5 differences between PN diode and Zener diode.

(OR)

15(b) Explain the working of JFET.

16(a) Write any 5 differences between FET and MOSFET.

(OR)

16(b) Explain the characteristics of depletion MOSFET.