

AU-106: BASICS OF AUTOMOBILE ELECTRICAL AND ELECTRONICS

Course Title	Basics Of Automobile Electrical and Electronics	Course Code	AU-106
Semester	I	Course Group	Core
Teaching Scheme in Periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Hours :	150 HOURS
CIE	20+20+20 = 60 Marks	SEE	40 Marks

Pre requisites:

This course requires the basic knowledge of Basic Physics, Chemistry and Mathematics at the diploma first year level.

Course Outcomes:

On successful completion of the course student should able to:

CO1	Understand and explain basic electrical, Calculate the induced EMF in a coil for the given specific conditions.
CO2	Specify the application of a given resistor, inductor or capacitor for the given conditions.
CO3	Calculate the number of turns of a transformer for the given input and output using EMF equation of a transformer.
CO4	Explain the application of a diode or a transistor for the specified conditions.
CO5	Illustrate the working of a given D.C Motor or Generator.
CO6	Convert the given number from one number system into another system.

Course Content:

Unit-1: Electromagnetic Induction

DURATION:20 HOURS

Electrical Units of Current, Voltage, Resistance, Power, Energy- Concept of Potential difference –Ohm’s Law – Series and parallel circuits – Determination of total resistance of a given series circuit, parallel circuit, Series and Parallel circuits - Kirchhoff’s Laws, Simple and elementary problems on Kirchhoff’s laws - Relation between Magnetism and Electricity – Production of induced emf and current – Faradays laws of electromagnetic induction – Direction of induced emf : Flemings right hand rule and left hand rule, Lenz law – Induced emf: Dynamically induced emf and Statically induced emf – Statically induced emf :Mutually induced emf and self induced emf – Self inductance and Mutual inductance – Numerical problems.

Unit-2: Resistors, Inductors and Capacitors

DURATION:20 HOURS

Introduction – Resistors: Classification of resistors: Fixed resistors and Variable resistors — Variable resistors: Types of variable resistors: Wire wound resistors or Potentiometers, Carbon Potentiometers and Other types such as Rheostats, Decade resistance boxes, Thermistors, Varistors, LDR, Trimmer – LDR and VDR: Constructional details and working.

Inductors: Definition - Classification– Audio Frequency Chokes, Radio Frequency Chokes

Capacitors: Definition of Capacitance and Capacitor, Units of Capacitance – Classification of capacitors - Markings for different types of capacitors: Electrolytic, Ceramic, Plastic

Unit-3: A.C Fundamentals & A.C Machines

DURATION:20 HOURS

A.C and D.C forms of current – Sine wave – Basic terms of sine wave – Equations for Instantaneous values – Single phase and Poly phase sine waves - Numerical Problems.

Motor definition – 3-Phase induction motor: Principle of operation, Constructional details, Starters for Induction Motor: Direct-on-line (DOL) Starter, Star-Delta Starter and Rotor resistance starter connection – Direction of rotation – Applications of 3-phase Induction Motors.

Classification and Types single phase of Motors: Induction motors: Squirrel cage rotor and Wound rotor, Repulsion type motors or Single phase wound motors, AC series Motors, Universal Motors, Synchronous motors and Unexcited Synchronous motors – Working Principle of single phase motors: Cross field theory and Double revolving field theory – Split phase Motor: Capacitor start and Capacitor run Motors, Capacitor start and Induction run Motors – Shaded pole motor - Universal Motor – Application of single phase motors – Changing the direction of rotation of motor.

Unit-4: Diodes and Transistors

DURATION:20 HOURS

Diode definition; Types of diodes – Varactor diode, Zener diode, Photodiode – Construction and working, Characteristics and Applications of these diodes.

Bipolar Junction Transistor (BJT): Formation of Transistor – Biasing of transistor – Working of PNP and NPN transistors – Applications of Transistors – Input / Output Characteristics of CB,CE and CC Configurations– Transistor as a switch and Transistor as an amplifier.

Photo transistor: Construction, Operation, Characteristics of Photo transistor – Advantages and Limitations of Photo transistor.

Uni-Junction Transistor (UJT): Construction of UJT- Equivalent circuit of UJT - Working principle of UJT – Characteristics of UJT

Field Effect Transistor (FET): Classification of FETs – Construction of JFET: n-channel and p-channel – Principle of operation of N-channel JFET

Metal Oxide Semiconductor Field Effect Transistor (MOSFET): Types of MOSFET – Construction and working of n-channel depletion MOSFET

Unit-5: D.C Machines

DURATION:20 HOURS

Introduction – Working principle of D.C Generator – Fleming's Right hand rule – Working of a single loop generator – Constructional details of a D.C Generator – Types of D.C generators – EMF equation of a Generator.

D.C Motors: Working principle of a Motor – Fleming's Left hand rule – Types of D.C Motors – Torque equation of a D.C Motor – Necessity of a Starter for D.C Motor – Types of Starters: 3-point Starter and 4-point starter.

Unit-6: Basics of Digital Electronics

DURATION:20 HOURS

Number systems – Conversion from one number system into another – Performing arithmetic operations in binary - Use of weighted and Un-weighted codes - Importance of parity Bit - Different postulates in Boolean algebra - Basic logic gates with truth table- Universal logic gates: Exclusive OR gate with truth table - De-Morgan's theorems- AND, OR, NOT operations using NAND, NOR gates.

Recommended Reference Books

1. Basic Electrical and Electronics	by	B.L.Theraja	
2. Basic Electrical Engineering	by	V.K.Mehatha	
3. Electronic Devices and Circuits	by	David A.Bell	Prentice hall
4. Hand book of components for Electronics	by	Charles A. Harper	McGrawhills
5. Electrical engineering and basic electronics	by	G.B.Bharadwajan	
6. Basic Electrical and Electronic Engineering	by	K Manjunath	
7. Digital Electronics	by	N Dhananjaya	

Suggested Learning Outcomes:

- 1.0 Comprehend the basic Electrical units of current, voltage, power, energy.
- 1.1 State and Explain Ohm's Law
- 1.2 Differentiate between series and parallel electrical circuits
- 1.3 Compute the resistance of a conductor for a given length, area and resistivity.
- 1.4 State the relation between Magnetism and Electricity
- 1.5 Define the term Electromagnetic Induction
- 1.6 Explain the concept of induced emf and current
- 1.7 State Faradays laws of electromagnetic induction
- 1.8 Specify the direction of induced emf using Fleming's right hand rule
- 1.9 State the application of Fleming's left hand rule
- 1.10 State Lenz law
- 1.11 Define Induced emf
- 1.12 Define dynamically induced emf
- 1.13 Define statically induced emf
- 1.14 Differentiate between statically induced emf and dynamically induced emf.
- 1.15 State the types of statically induced emf
- 1.16 Define mutually induced emf
- 1.17 State the conditions for self induced emf
- 1.18 Define Inductance.
- 1.19 Specify the formula for calculating Self induced emf
- 1.20 Differentiate between Self inductance and Mutual inductance
- 1.21 State the formula for calculating mutually induced emf
- 1.22 Solve the given numerical problems.
- 2.0 Define a Resistor.
- 2.1 Classify resistors.
- 2.2 Define a Fixed resistor.
- 2.3 State the function of a Variable resistor.
- 2.4 Specifications of fixed resistor.
- 2.5 State the importance of fixed resistor.

- 2.6 State the types of variable resistors.
- 2.7 List the types of Potentiometers.
- 2.8 Expand LDR.
- 2.9 Expand VDR.
- 2.10 Describe the Constructional details and working of a LDR.
- 2.11 Explain the Constructional details and working of a LDR.
- 2.12 Define an Inductor.
- 2.13 Classify Inductors.
- 2.14 Enumerate the types of Inductors.
- 2.15 Define Capacitance and Capacitor.
- 2.16 State the units of Capacitance.
- 2.17 Write the Classification of capacitors.
- 2.18 List types of capacitors as per the material used .

- 3.0 State the forms of current
- 3.1 Draw a Sine wave
- 3.2 List the basic terms of sine wave
- 3.3 Define the basic terms of a sine wave
- 3.4 State the equations for Instantaneous values of a sine wave
- 3.5 Draw Single phase and Poly phase sine waves
- 3.6 Solve Numerical Problems for the given conditions.
- 3.7 Define a Motor
- 3.8 State the working principle of a motor
- 3.9 Explain the Constructional details and working of an Induction motor
- 3.10 List the types Starters for Induction Motor
- 3.11 State the guidelines to change the direction of rotation of a motor

- 3.12 State the Applications of 3-phase Induction Motors.
- 3.13 Give the Classification of single phase of Motors
- 3.14 List the types of single phase Induction motors
- 3.15 State the Working Principles of single phase motors
- 3.16 Explain the working of Split phase Motor
 - a) Capacitor start and Capacitor run Motors.
 - b) Capacitor start and Induction run Motors.
- 3.17 Explain the working of Shaded pole motor
- 3.18 Illustrate the working of Universal Motor
- 3.19 State the Application of single phase motors
- 3.20 State the conditions for changing the direction of rotation of motor.

- 4.0 Explain the Construction and working of Varactor diode.
- 4.1 List and explain the Characteristics of Varactor diode.
- 4.2 Explain the Construction and working of Zener diode.
- 4.3 List and explain the Characteristics of Zener diode.
- 4.4 Explain the Construction and working of Photodiode.
- 4.5 List and explain the Characteristics of Photodiode.
- 4.6 Explain the formation a Bipolar Junction Transistor (BJT).
- 4.7 Explain about the Biasing of transistor.
- 4.8 Comprehend the working of PNP transistor.
- 4.9 Comprehend the working of NPN transistor.
- 4.10 Write a note on Transistor Configurations.
- 4.11 Draw the circuit for Common Base Configuration of a PNP transistor.
- 4.12 Sketch the circuit for Common Base Configuration of a NPN transistor.
- 4.13 Explain the Input Characteristics of CB configuration.
- 4.14 Explain the Output Characteristics of CB configuration.
- 4.15 Draw the circuit for Common Emitter Configuration of a PNP transistor.
- 4.16 Sketch the circuit for Common Emitter Configuration of a NPN transistor.
- 4.17 Explain the Input Characteristics of CE configuration.
- 4.18 Explain the Output Characteristics of CE configuration.
- 4.19 Draw the circuit for Common Collector Configuration of a PNP transistor.
- 4.20 Sketch the circuit for Common Collector Configuration of a NPN transistor.
- 4.21 Explain the Input Characteristics of CC configuration.
- 4.22 Explain the Output Characteristics of CC configuration.
- 4.23 Explain how a transistor can be used as a switch.
- 4.24 Describe how a transistor can work as an amplifier.
- 4.25 Explain the Construction and Operation of a Photo transistor.
- 4.26 Explain the Characteristics of Photo transistor.
- 4.27 Explain the Construction of UJT
- 4.28 List the components in the Equivalent circuit of UJT

- 4.29 Draw the Equivalent circuit of UJT
- 4.30 Explain the Working principle of UJT with the help of Equivalent circuit
- 4.31 List and explain the Characteristics of UJT
- 4.32 Write the Classification of FETs
- 4.33 Explain the Construction of both n-channel and p-channel JFET
- 4.34 Explain the Principle of operation of N-channel JFET
- 4.35 Enumerate the merits of JFET over BJT.
- 4.36 List the types of MOSFET
- 4.37 Explain the Construction and working of n-channel depletion MOSFET

- 5.0 State the working principle of a D.C Generator
- 5.1 Explain Fleming's Right hand rule
- 5.2 Describe the working of a single loop generator
- 5.3 Explain the Constructional details of a D.C Generator
- 5.4 List the types of D.C generators
- 5.5 State the EMF equation of a Generator.
- 5.6 State the working principle of a Motor
- 5.7 Explain the Fleming's Left hand rule
- 5.8 List the types of D.C Motors
- 5.9 State the Torque equation of a D.C Motor
- 5.10 Explain the necessity of a Starter for D.C Motor
- 5.11 List the types of Starters used for a D.C Motor
- 5.12 Explain the working of 3-point Starter
- 5.13 Explain the working of 4-point starter.

- 6.0 State the application of digital electronics
- 6.1 Name the two main types of number systems
- 6.2 Explain Non-positional number system
- 6.3 Explain Positional number system
- 6.4 List the types of Positional number systems
- 6.5 Define Base or Radix
- 6.6 Explain the concept of Binary number system
- 6.7 Illustrate octal number system
- 6.8 Explain Hexadecimal number system
- 6.9 Illustrate decimal number system
- 6.10 Compare different number systems
- 6.11 Explain the conversion of Decimal to Binary
- 6.12 Explain Decimal to Octal conversion
- 6.13 Explain Decimal to Hexadecimal conversion
- 6.14 Explain the conversion of Binary to Decimal
- 6.15 Narrate Binary addition
- 6.16 Explain Binary Subtraction

- 6.17 Explain Binary Multiplication
- 6.18 Explain Binary Division
- 6.19 State the use of weighted and un-weighted codes
- 6.20 State the use of digital codes.
- 6.21 Explain the conversion of a given binary number to Gray code.
- 6.22 State and prove De-Morgan's First theorem.
- 6.23 State and prove De-Morgan's Second theorem.
- 6.24 Interpret the basic logic gates (AND, OR, NOT).
- 6.25 Explain the working of universal logic gates (NAND, NOR).
- 6.26 Solve problems on conversion of binary to decimal and vice-versa
- 6.27 Solve problems on Binary addition, subtraction, multiplication and division.

Suggested E-Learning references:

1. Fundamentals of Electrical Engineering
https://www.youtube.com/watch?v=3TR_DS_7z2w&list=PLbRMhDVUMngfdEXVcdf_ijk2Eub-UHs_y
2. Ohm's Law etc., https://www.youtube.com/watch?v=bT1Ko-1_1nY
3. <http://electrical4u.com/>
4. www.electronics-tutorials.ws
5. www.nptel.ac.in

CO PO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1
CO1	3	1	1	-	1	1	3	2
CO2	3	3	3	2	3	3	3	2
CO3	3	2	3	3	2	3	3	2
CO4	3	1	3	3	1	3	3	2
CO5	3	1	2	1	2	1	3	2
CO6	3	1	3	3	3	2	3	2

Blue Print of Continuous Internal Evaluation (CIE):

MID SEM –I EXAM					Max.Marks: 20
S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					Max.Marks: 20
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Internal Assessment:		Max.Marks : 20
S.No	Type of Test	Marks
1	Slip Test -1	5
2	Slip Test - 2	5
3	Assignment	5
4	Seminar	5

Course Content and Blue Print of Marks for SEE:

S.No	Unit Name	Questions for SEE				Periods
		R		U	A	
1	Electromagnetic Induction	4	1	9(a)	13(a)	12
2	Resistors, Inductors and Capacitors					08
3	A.C Fundamentals & A.C Machines.		2	10(a)	14(a)	12
4	Diodes and Transistors					10
5	D.C Machines		3	5, 6	9(b) 11(a) 11(b)	08
6	Basics of Digital Electronics					
						10

Total Questions	8	8	8	60
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BOARD DIPLOMA EXAMINATIONS (C-26)
3rd SEMESTER, D.A.E, MIDSEM – I
AU-106, BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Time: 1 Hour

Max. Marks: 20

PART – A

Instructions: Answer all questions.

Each question carries one mark.

4 X 1 = 4 marks

1. Define Ohm's Law.
2. Define mutually induced emf.
3. List any types of resistors.
4. Mention the types of capacitors.

PART – B

Instructions: Answer the following questions.

Each question carries three marks

2 x 3 =6 Marks

- 5 a. Explain Fleming's right hand rule?
(OR)
- b. Write a note on Faradays laws of electromagnetic induction.
- 6 a. state the function of LDR.
(OR)
- b. List the types of inductors.

PART – C

Instructions: Answer the following questions.

Each question carries five marks

2 x 5 =10 Marks

- 7 a. If the flux linkage in coil 1 is 3Wb and it has 500 turns and the current in coil 2 is 2A, calculate the mutual inductance.
(OR)
- b. When a current of 2mA is supplied to a coil with 100 turns, a magnetic flux of magnitude 0.2Wb is linked with it. Find the self-inductance of this coil.
- 8 a. Classify different types of capacitors.
(OR)
- b. Explain any one type of inductor.

BOARD DIPLOMA EXAMINATIONS (C-26)
3rd SEMESTER, D.A.E, MIDSEM – II
AU-106, BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Time: 1 Hour

Max. Marks: 20

PART – A

Instructions: Answer all questions.

Each question carries one mark.

4 X 1 = 4 marks

1. Define frequency with respect to A.C Fundamentals?
2. Define cycle with respect to sine wave?
3. Define a motor.
4. Define a diode.

PART – B

Instructions: Answer the following questions.

Each question carries three marks

2 x 3 =6 Marks

- 5 a. Calculate the time period and frequency of a sine wave of voltage $v = 20 \sin(500\pi t)$ volts.
(OR)
- b. State the working principle of a motor.
- 6 a. Derive the expression for collector current in CE configuration.
(OR)
- b. . Explain the working of transistor as amplifier.

PART – C

Instructions: Answer the following questions.

Each question carries five marks

2 x 5 =10 Marks

- 7 a. Explain the working of Shaded pole motor.
(OR)
- b. Explain the constructional details and working of an Induction motor.
- 8 a. Compare the performance characteristics of CB,CE and CC configuration.
(OR)
- b. Explain the working of NPN transistor.

BOARD DIPLOMA EXAMINATIONS (C-26)
3rd SEMESTER, D.A.E, MIDSEM – II
AU-106, BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Time: 1 Hour

Max. Marks: 20

PART – A

Instructions: Answer all questions.

Each question carries one mark.

8 X 1 = 8 marks

1. Define Ohm's law.
2. What is an RF choke?
3. Define beta of a transistor.
4. List types of diode .
5. State the function of LCD.
6. State the function of LCD display.
7. Draw the symbol of JFET and MOSFET.
8. What are the parameters of JFET?

PART – B

Instructions:

Answer the following questions.

Each question carries three marks

4 x 3 =12 Marks

- 9 a. Derive the expression for equivalent resistance when resistances are connected in series.

(OR)

- b. Explain the selection of operating point on DC load line.

- 10 a. List the common types of inductors.

(OR)

- b. List the important applications of JFET.

- 11a. State the need for proper biasing in amplifier circuits.

OR

- b. List the factors affecting the Q point.

- 12a. List the merits of JFET over BJT.

OR

- b. Draw and explain the mutual characteristics of JFET.

PART – C

Instructions:

Answer the following questions.

Each question carries five marks

4 x 5 =20 Marks

- 13a. List the types of capacitor and explain their importance.

(OR)

- b. Explain the drain characteristics of JFET.

- 14 a. Explain the working principle of Varactor diode.

- (OR)** b. Explain the working principle of enhancement type of MOSFET.

15 a. Explain the concept of DC and AC load line.

(OR)

b. Explain the self- bias circuit.

16 a. Explain the drain characteristics of n-channel JFET

(OR)

b. List any 5 merits of JFET over BJT