# C24_CURRICULUM

# DIPLOMA IN

# ELECTRICAL AND ELECTRONICS ENGINEERING

## Offered By

# STATE BOARD OF

# TECHNICAL EDUCATION AND TRAINING TELANGANA HYDERABAD

## III SEMESTER

| S. NO | Course | | Teaching Scheme | | | | | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Instruction Periods per week | | | Total Periods per semester | Credits | Continuous Internal Evaluation (CIE) | | | Semester End Examination (SEE) | | | |
| | Code | Course Name | L | T | P | | | Mid Sem 1 | Mid Sem 2 | Internal Evaluation | Max marks | Min marks | Total Marks | Min marks for passing including internal |
| 1 | SC-301 | Applied Engineering Mathematics | 4 | 1 | 0 | 75 | 2.5 | 20 | 20 | 20 | 40 | 14 | 100 | 35 |
| 2 | EC-302 | Digital Electronics | 4 | 1 | 0 | 75 | 2.5 | 20 | 20 | 20 | 40 | 14 | 100 | 35 |
| 3 | EE-303 | DC Machines & Batteries | 4 | 1 | 0 | 75 | 2.5 | 20 | 20 | 20 | 40 | 14 | 100 | 35 |
| 4 | EE-304 | Electrical Circuits | 4 | 1 | 0 | 75 | 2.5 | 20 | 20 | 20 | 40 | 14 | 100 | 35 |
| 5 | EE-305 | Electrical Power Systems-Generation | 4 | 1 | 0 | 75 | 2.5 | 20 | 20 | 20 | 40 | 14 | 100 | 35 |
| 6 | EE-306 | Electrical & Electronic Measuring Instruments | 4 | 1 | 0 | 75 | 2.5 | 20 | 20 | 20 | 40 | 14 | 100 | 35 |
| 7 | EC-307 | Digital Electronics Lab | 1 | 0 | 2 | 45 | 1.25 | 20 | 20 | 20 | 40 | 20 | 100 | 50 |
| 8 | EE-308 | DC Machines Lab | 1 | 0 | 2 | 45 | 1.25 | 20 | 20 | 20 | 40 | 20 | 100 | 50 |
| 9 | EE-309 | Circuits & Measurements | 1 | 0 | 2 | 45 | 1.25 | 20 | 20 | 20 | 40 | 20 | 100 | 50 |
| 10 | HU-310 | Communication Skills & Life Skills Lab | 1 | 0 | 2 | 45 | 1.25 | 20 | 20 | 20 | 40 | 20 | 100 | 50 |
| | | | 28 | 6 | 8 | 630 | 20 | 200 | 200 | 200 | 400 | 164 | 1000 | 410 |

# SC-301 : APPLIED ENGINEERING MATHEMATICS

| | | | |
|---|---|---|---|
| Course Title | Applied Engineering Mathematics | Course Code | SC-301 |
| Semester | III | Course Group | Foundation |
| Teaching Scheme in Periods ( L : T : P ) | 4:1:0 | Credits | 2.5 |
| Methodology | Lecture + Tutorial | Total Contact Periods | 75 |
| CIE | 60 Marks | SEE | 40 Marks |

**Pre requisites:**

This course requires the knowledge of Basic Engineering Mathematics and Engineering Mathematics at Diploma 1st and 2nd Semester level.

**Course Outcomes(COs):**

At the end of the course, the student will have the ability to:

| | |
|---|---|
| CO 1 | Integrate various continuous functions using substitution method |
| CO 2 | Integrate various continuous functions using different methods of integration |
| CO 3 | Integrate various functions by using Partial fractions and Integration by parts. |
| CO 4 | Evaluate the Definite Integrals using Fundamental Theorem of Integral Calculus and its properties. |
| CO 5 | Solve the problems in Areas of irregular shapes and Volumes of solids of revolution |
| CO 6 | Solve the engineering problems by applying concept of Mean and RMS values of varies functions and Solve numerical problems in the engineering by using Trapezoidal and Simpson's 1/3 rd rule |

**Course Content:**

**Unit-I Indefinite Integration – I: Duration: 13Periods (L: 10– T:3)**

Integration as an inverse process of Differentiation- Indefinite integral of standard functions- Properties of Indefinite Integral- Integration by Substitution - Integrals using Trigonometric identities of the form: $\int \sin^2 x\, dx, \int \cos^2 x\, dx, \int \sin^3 x\, dx$ , $\int \cos^3 x\, dx, \int \sin Ax \cos Bx\, dx, \int \cos Ax \cos Bx\, dx$ and

$\int \sin Ax \sin Bx \ dx$, where *A* and *B* are constants- Integrals of tan *x*, cot *x*, sec *x* and cosec *x*-Integrals of the form $\int \sin^m x . \cos^n dx$ and $\int \tan^m x . \sec^n dx$, where *m* and *n* are positive integers.

**Unit – II Indefinite Integration – II:** **Duration: 12Periods (L: 10– T:2)**

Integrals of some particular functions (Nine standard integrals) of the type: $\int \frac{1}{a^2+x^2} dx$, $\int \frac{1}{a^2-x^2} dx$, $\int \frac{1}{x^2-a^2} dx$, $\int \frac{1}{\sqrt{a^2+x^2}} dx$, $\int \frac{1}{\sqrt{a^2-x^2}} dx$, $\int \frac{1}{\sqrt{x^2-a^2}} dx$, $\int \sqrt{a^2+x^2}\, dx$, $\int \sqrt{a^2-x^2}\, dx$ and $\int \sqrt{x^2-a^2}\, dx$ - Integrals of the type: $\int \frac{1}{ax^2+bx+c} dx$ , $\int \frac{1}{\sqrt{ax^2+bx+c}} dx$ , $\int \sqrt{ax^2+bx+c}\, dx$ , $\int \frac{px+q}{ax^2+bx+c} dx$ , $\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx$ , $\int (px+q)\sqrt{ax^2+bx+c}\, dx$ , $\int \frac{1}{a \pm b \sin x} dx$ , $\int \frac{1}{a \pm b \cos x} dx$ and $\int \frac{1}{a \sin x \pm b \cos x \pm c} dx$, where *a*, *b*, *c*, *p* and *q* are constants.

**Unit-III Indefinite Integration–III:** **Duration: 12 Periods (L: 10 – T:2)**

Integration by using Partial fractions-Integration by parts - Bernoulli's rule for integration by parts - Integrals of the type: $\int e^{ax} \sin bx \, dx$, $\int e^{ax} \cos bx \, dx$ and $\int e^x [f(x) + f'(x)] dx$, where *a* and *b* are constants.

**Unit – IV Definite Integral and its Properties:** **Duration:13Periods(L:10–T:3)**

Definite integral - Fundamental Theorem of Integral Calculus –Evaluation of definite integrals by Substitution Method- Properties of Definite Integrals -Evaluation of Definite integrals by applying their properties.

**Unit – V Applications of Definite Integrals:** **Duration: 13Periods (L: 10 – T:3)**

Areas under simple curves -Sign of the Area -The area of the region bounded by a curve and a line - Area between two curves -Volumes of solids of revolution about axes - Volumes of solids of revolution

of the area of the region bounded by the curve and a line about axes - Volumes of solids formed by rotating a region bounded by the curves about axes.

**Unit – VI Mean, RMS values and Numerical Integration: Duration: 12Periods (L: 10 – T:2)**

Mean Values and Root Mean Square (R.M.S) values of a function in a given interval-Numerical Integration: Trapezoidal rule and Simpson's $\frac{1}{3}$-rule to evaluate an approximate value of a definite integral in a given interval- Problems leading to engineering applications.

**Reference Books:**

1. Higher Engineering Mathematics, by B.S.Grewal - Khanna publishers.

2. Thomas' Calculus, Pearson Publishers.

3. NCERT Mathematics Text Book for class XII, Part II.

4. Integral Calculus by Shanti Narayan and P. K. Mittal, S. Chand Publishers.

**Suggested E-Learning references:**

1. https://www.khanacademy.org/
2. https://www.wolframalpha.com/
3. https://onlinecourses.nptel.ac.in/
4. http://tutorial.math.lamar.edu/

**Suggested Learning Outcomes:**

At the end of the course, the student will have the ability to:

**1.0 Apply the properties of Indefinite Integral and Substitution Method to evaluate the**

**Indefinite Integrals of various functions.**

1.1 Explain the concept of Integration asan inverse process of Differentiation with standard notations.

1.2 Classify the Definite and Indefinite Integrals.

1.3. Formulate the standard Integrals using the definition of Integration.

1.4. State the properties of Definite Integrals.

(i.e., $\int (u \pm \mathrm{v})dx$, and $\int ku\ dx$,where *u, v* are functions in *x*and *k* is a scalar).

1.5 Use the Indefinite integrals of standard functions and properties of Integralsin solving engineering problems.

1.6 Evaluate Integrals involving simple functions of the following types by the method of Substitution:

i) $\int f(ax+b)dx$,where *f*(*x*)is in standard form,

ii)$\int f\big(g(x)\big)g'(x)dx$,

iii)$\int f(x^n)x^{n-1}dx$,

iv)$\int [f(x)]^n f'(x)dx$,

v)$\int \frac{f'(x)}{\sqrt{f(x)}}dx$

and vi) $\int \frac{f'(x)}{f(x)}dx$

1.7 Find the integrals of tan *x*, cot *x*, sec *x* and cosec*x*.

1.8 Use some trigonometric identities to find the integrals of the type: $\int \sin^2 x\ dx$, $\int \cos^2 x\ dx$, $\int \sin^3 x\ dx$, $\int \cos^3 x\ dx$, $\int \sin Ax \cos Bx\ \ dx$, $\int \cos Ax \cos Bx\ \ dx$ and $\int \sin Ax \sin Bx\ \ dx$, where

*A* and *B* are constants.

1.9 Evaluate the integrals of the type: $\int \sin^m x.\cos^n dx$,where *m* and *n* are positive integers.

1.10 Evaluate the integrals of type: $\int \tan^m x.\sec^n dx$, where *m* and *n* are positive integers.

## 2.0 Formulate the Integrals of some particular functions and apply them for integrating many other related standard Integrals.

2.1 Evaluate theintegrals of some particular functions (Nine standard integrals) of the type:

$$\int \frac{1}{a^2+x^2}dx, \int \frac{1}{a^2-x^2}dx, \int \frac{1}{x^2-a^2}dx, \int \frac{1}{\sqrt{a^2+x^2}}dx, \int \frac{1}{\sqrt{a^2-x^2}}dx, \int \frac{1}{\sqrt{x^2-a^2}}dx, \int \sqrt{a^2+x^2}dx,$$

$\int \sqrt{a^2-x^2}dx$and $\int \sqrt{x^2-a^2}dx$,where *a* is a constant.

2.2 Evaluate the integrals of the type: $\int \frac{1}{ax^2+bx+c}dx$, $\int \frac{1}{\sqrt{ax^2+bx+c}}dx$ and $\int \sqrt{ax^2+bx+c}\,dx$,

where *a*, *b* and *c* are constants.

2.3Evaluate the integrals of the type: $\int \frac{px+q}{ax^2+bx+c}dx$, $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$ and

$\int (px+q)\sqrt{ax^2+bx+c}\,dx$,where *a, b, c, p* and *q* are constants.

2.4Evaluate the integrals of the type: $\int \frac{1}{a\pm bsinx}dx$, $\int \frac{1}{a\pm bcosx}dx$ and $\int \frac{1}{asinx \pm bcosx \pm c}dx$,

where *a*, *b* and *c* are constants.

## 3.0 Integrate various functions by using Partial fractions and Integration by parts.

3.1 Evaluate Indefinite Integrals using Partial fractions.

3.2 Evaluate Indefinite Integrals using Integration by parts.

3.3 Apply the Bernoulli's rule for evaluating the Integrals of the form $\int u.v\,dx$, where *u* and

*v* are functions in *x*.

3.4 Evaluate the Integrals of the form $\int e^{ax} \sin bx \, dx$ and $\int e^{ax} \cos bx \, dx$,where $a$ and $b$ are constants.

3.5 Evaluate the Integrals of the form $\int e^{x}[f(x) + f'(x)] \, dx$.

**4.0 Evaluate the Definite Integrals using Fundamental Theorem of Integral Calculus and its properties.**

4.1 State the Fundamental Theorem of Integral Calculus.

4.2 Calculate the Definite Integrals over an interval by using the Fundamental Theorem of Integral Calculus.

4.3 Evaluate the Definite Integrals by using Substitution Method.

4.4Explain various properties of Definite Integration.

4.5 Evaluate the Definite Integrals byusing its properties.

**5.0 Compute the Areas of irregular shapes and Volumes of solids of revolution using the concept of Definite Integrals.**

5.1 Define Area under simple curves.

5.2 Describe the sign of the Areas of simple curves.

5.3 Calculate the Areas under simple curves.

5.4 Determine the area of the region bounded by a curve and a line.

5.5 Find the area enclosed between two curves using methods of Definite Integration.

5.6 Define the volume of a solid generated by revolving a region bounded by the curves about axes.

5.7 Explain Volumes of solids of revolution.

5.8 Calculate the Volumes of a solid that is obtained by revolving a plane region about axes.

5.9 Compute the Volumes of solids of revolution of the area of the region bounded by the curve and a line about axes.

5.10 Evaluate the Volumes of solids formed by rotating a region bounded by the curves about axes.

**6.0 Find the Mean and RMS values of various functions in engineering problems and evaluate Numerical Integral of functions available only at discrete points.**

6.1 ExplainMean Value, Mean Square Value and Root Mean Square (RMS) value of the functions in any given interval.

6.2 Obtain the Mean Value, Mean Square Value and Root Mean Square (RMS) values of the functions in any given interval.

6.3 Explain Trapezoidal rule and Simpson's $\frac{1}{3}$rules.

6.4 Apply the Trapezoidal rule, Simpson's $\frac{1}{3}$ rules for for approximation of definite integrals

6.5 Solve theproblems leading to engineering applications by using above methods.

**Suggested Student Activities:**

1. Student visits Library to refer Standard Books on Mathematics and collect related material.

2.Quiz.

3.Group discussion.

4.Surprise tests.

5. Seminars.

6. Home Assignments.

7. Mathematics for preparing competitive exams and solving old question papers on arithmetical ability.

**CO / PO - MAPPING**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | Mapped POs |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | | | 3 | 1, 2 ,7 |
| CO2 | 3 | 2 | | | | | 3 | 1, 2 ,7 |
| CO3 | 3 | 2 | | | | | 3 | 1, 2 ,7 |
| CO4 | 3 | 2 | | | | | 3 | 1, 2 ,7 |
| CO5 | 3 | 2 | 2 | | | | 3 | 1, 2 ,3,7 |
| CO6 | 3 | 2 | 2 | | | | 3 | 1, 2, 3, 7 |

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA**

**DIPLOMA EXAMINATIONS (C - 24)**

**SC-301**

**SEMESTERIII,MID –I EXAM, MODEL PAPER**

**APPLIED ENGINEERING MATHEMATICS**

**(Open Book System)**

**TIME: 1: 00 Hour** **Max. Marks: 20**

**PART-A**

Instructions: 1. Answer **ALL** questions. 04 × 01 = 04

2 Each question carries **ONE** mark.

1. Find: $\int \left(2x - \sqrt{x} + x^3\right) dx$.
2. Find: $\int \frac{dx}{3x+7}$.
3. Find: $\int \frac{dx}{\sqrt{25-x^2}}$.
4. Find: $\int \sqrt{7+x^2}$ dx.

**PART-B**

Instructions: 1. Answer **ALL** questions. 02 × 03 = 06

2. Each question carries **THREE** marks.

5(a) Evaluate: $\int sin^3 x \, dx$.

OR

5(b) Evaluate: $\int \frac{cos\sqrt{2x}}{\sqrt{2x}} dx$.

6(a)Evaluate: $\int \frac{3x^2}{4+x^6} dx$.

OR

6(b)Evaluate: $\int \sqrt{x^2+2x+5}\, dx$.

**PART- C**

Instructions: 1. Answer **ALL** questions. 02 × 05 = 10

2. Each question carries **FIVE** marks.

7(a) Evaluate: $\int \frac{dx}{4sin^2x+9cos^2x}$.

OR

7(b) Evaluate: $\int sin^7x.cos^3d$

8(a)Evaluate: $\int \frac{2x+5}{\sqrt{x^2-2x+2}}dx$.

OR

8(b)Evaluate: $\int \frac{\mathbf{1}}{4sinx+3cosx+6}dx$.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA**

**DIPLOMA EXAMINATIONS (C - 24)**

**SC-301**

**SEMESTERIII,MID –II EXAM, MODEL PAPER**

**APPLIED ENGINEERING MATHEMATICS**

**(Open Book System)**

**TIME: 1: 00 Hour** **Max. Marks: 20**

**PART-A**

Instructions: 1. Answer **ALL** questions. 04 × 01 = 04

2 Each question carries **ONE** mark.

1. Find: $\int e^{2x} sin3x\, dx$.
2. Find: $\int e^{x} (\cot x + \log \sin x)\, dx$.
3. Find: $\int_0^1 (x^4 + 1)\, dx$
4. Find: $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x\, cos\, x^2\, dx$.

**PART-B**

Instructions: 1. Answer **ALL** questions. 02 × 03 = 06

2. Each question carries **THREE** marks.

5(a) Evaluate: $\int \sinh 2x\, .\, sin2x\, dx$.

OR

5(b) Evaluate: $\int x^3 sin2x\, dx$ by using Bernoulli's rule.

6(a) Evaluate: $\int_0^{\frac{\pi}{2}} \frac{sin^{2025} x}{sin^{2025} x + cos^{2025} x}\, dx$.

OR

6(b) Evaluate: $\int_0^{2\pi} cos^2\, 7x\, dx$.

**PART C**

Instructions: 1. Answer **ALL** questions. $02 \times 05 = 10$

2. Each question carries **FIVE** marks.

7(a) Evaluate: $\int \frac{x^2}{x^2+7x+10}\,dx$.

OR

7(b)Evaluate: $\int \frac{x\cos^{-1}x}{\sqrt{1-x^2}}\,dx$.

8(a) Evaluate: $\int_0^{\pi} \frac{x}{25\cos^2 x+16\sin^2 x}\,dx$.

OR

8(b) Evaluate: $\int_0^1 \frac{\cos^{-1}x}{x}\,dx$.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA**

**DIPLOMA EXAMINATIONS (C - 24)**

**SC-301**

**SEMESTER III, SEMESTER END EXAM, MODEL PAPER**

**APPLIED ENGINEERING MATHEMATICS**

**(Open Book System)**

**Time: 2 hours** **[Total Marks: 40]**

**PART-A**

Instructions: 1. Answer **ALL** questions. 08 ×01 = 08

2 Each question carries **ONE** mark.

1. Find $\int(a_0 + a_1x + a_2x^2 + \cdots + a_nx^n))dx$.

2. Find $\int_{-1}^{1} x^2 sin\, x^3\, dx$.

3. Find the area bounded by the curve y = $x^2$, the *x* – axis and the ordinates *x* = 1and *x* = 3.

4. Find $\int \frac{1}{x cos^2(log x)} dx$.

5. Find the mean value of sin *x* over (0, 2π).

6. Find the volume of the solid generated when the area bounded by the curve y = $x^3$, the *x* – axis and the lines *x* = 0 to *x* = 1.

7. Find the R.M.S value of $\sqrt{x}$over the range (2, 3).

8. Find the approximate value of $\int_0^6 f(x)\, dx$ from the following table:

| *x* | 0 | 2 | 4 | 6 |
|---|---|---|---|---|
| f(*x*) | 3 | 7 | 11 | 9 |

by Trapezoidal Rule.

**PART-B**

Instructions: 1. Answer **ALL** questions. 04 × 03 = 12

2. Each question carries **THREE** marks.

9(a) Evaluate: $\int \frac{1}{\sqrt{sin^{-1}x}\sqrt{1-x^2}}dx$.

OR

9(b) Find the area bounded by the curve y = cos *x* in (0, π).

10(a) Evaluate: $\int_0^5 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{5-x}}dx$.

OR

10(b) A swimming pool is 100 feet wide and the depth *d* in meters at a distance *x* meters from one bank is given by the following table:

| | | | | | | |
|---|---|---|---|---|---|---|
| *x* | 0 | 20 | 40 | 60 | 80 | 100 |
| *d* | 0 | 7 | 9 | 15 | 8 | 2 |

Find the cross-section area of the swimming pool using Simson's $\frac{1}{3}$-rule.

11(a) Find the area included between the parabola $x^2 = 16y$ and its latus rectum.

OR

11(b) Find the volume of the solid by rotating one arc of the curve *y* = sin 3*x* about *x* – axis.

12(a) Find the RMS value of *i* = 3 sin *x* over the half wave.

OR

12(b) Find the Mean value of $x^2 - 5x + 4$ between the values of *x*,where the expression vanishes.

**PART C**

Instructions: 1. Answer **ALL** questions 04 × 05 = 20

2. Each question carries **FIVE** marks

13(a) Evaluate: $\int \frac{5x+3}{\sqrt{x^2+4x+10}}dx$.

OR

13(b) Find the area enclosed between the curve $y^2 = 8x$ and the line $2y = x$.

14(a) Evaluate: $\int \frac{1}{x^4-1} dx$.

OR

14(b)The velocity of a train which starts from rest is given by the following table. The time is recorded in minutes from the start and speed in miles per hour.

| Minutes | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Miles/hour | 0 | 10 | 18 | 25 | 29 | 32 | 20 | 11 | 5 | 2 | 0 |

Estimate approximately the total distance run in 20 meters using Simson's $\frac{1}{3}$ - rule.

15(a) Find the area between the two parabolas $y^2 = 4x$ and $x^2 = 12y$.

OR

15(b) Find the volume of the right circular cone of height h and semi vertical angle α.

16(a) Determine the Root Mean Square value of the function $y = x^2 e^{3x}$ in the range between $x = 0$ and $x = 2$.

OR

16(b)Find the Mean value of $sin^2 \omega t$ in the interval $\left[0, \frac{2\pi}{\omega}\right]$.

# EC-302 : DIGITAL ELECTRONICS

| Course Title | **Digital Electronics** | Course Code | **EC-302** |
|---|---|---|---|
| Semester | **III** | Course Group | **Core** |
| Teaching Scheme in Hrs(L: T:P) | **4:1:0** | Credits | **2.5** |
| Methodology | **Lecture+ Assignments** | Total Contact Periods | **75** |
| CIE | **60 Marks** | SEE | **40 Marks** |

**Pre-requisites**

This course requires the basic knowledge of Semiconductor Devices.

**COURSE OUTCOMES**

| | |
|---|---|
| CO1 | Comprehend Number Systems and Binary Codes |
| CO2 | Analyze logic gates and simplify Boolean functions using Boolean laws and Karnaugh map |
| CO3 | Design combinational circuits – I |
| CO4 | Design combinational circuits – II |
| CO5 | Analyse and compare flip flops and registers |
| CO6 | Design counters and comprehend memories |

## COURSE CONTENT AND BLU PRNT OF MARKS FOR SEE

| Unit No | Unit Name | Periods | Questions to be set for SEE | | | | |
|---|---|---|---|---|---|---|---|
| | | | R | | | U | A |
| I | Number systems and Binary codes | 10 | Q4 | Q1 | | Q9(a) | Q13(a) |
| II | Boolean algebra, Logic gates and Karnaugh map | 15 | | | | | |
| III | Combinational circuits - I | 15 | | Q2 | | Q10(a) | Q14(a) |
| IV | Combinational circuits - II | 10 | | | | | |
| V | Flip Flops and registers | 15 | | Q3 | Q5,Q6 | Q9(b),Q11(a), Q11(b) | Q13(b),Q15(a), Q15(b) |
| VI | Counters and Memories | 10 | | | Q7,Q8 | Q10(b),Q12(a), Q12(b) | Q14(b),Q16(a), Q16(b) |
| | Total | 75 | 8 | | | 8 | 8 |

## COURSE CONTENTS

After completion of the course, the student should be able to know

**UNIT1 – NUMBER SYSTEMS AND BINARY CODES** **Duration: 10 Periods (L: 8– T: 2)**

Binary, Octal, Hexadecimal Number systems –comparison with Decimal system-Conversion from one number system into another – performing arithmetic operations in binary- Binary Codes -Use of weighted and Un-weighted codes- importance of parity Bit.

**UNIT2 – BOOLEAN ALGEBRA, LOGIC GATES & KARNAUGH MAP**

**Duration:15 Periods (L: 9 – T:6)**

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- De-Morgan's theorems - Simplify Boolean expressions (up to three variables)- standard representations for logical functions (SOP and POS form)- Boolean expressions from the given truth table- Karnaugh map to simplify Boolean Expression (up to 4 variables only).

**UNIT3 – COMBINATIONAL CIRCUITS- I** **Duration :15 Periods (L: 11– T: 4)**

Concept of combinational logic circuits- Half adder circuit - Half-adder using NAND gates only &NOR gates only- Full adder circuit - Full-adder using two Half-adders and an OR – gate – half subtractor and full subtractor - 4 Bit parallel adder using full – adders- 2's compliment parallel adder/ subtractor circuit -Serial adder -Performance of serial and parallel adder.

**UNIT4 –COMBINATIONAL CIRCUITS - II** **Duration: 10 Periods (L: 8– T: 2)**

Operation of 4 X 1 Multiplexers- Operation of 1 to 4 demultiplexer-applications- 8 X 3 encoder -Decimal to BCD encoder -3 X 8 decoder- BCD to decimal decoder- Applications - Tri-state buffer - Types of tri-state buffers-Applications - Digital comparator.

**UNIT5 – FLIP FLOPS AND REGISTERS** **Duration: 15 Periods (L: 10– T: 5)**

Concept of Sequential logic circuits- NAND and NOR latches with truth tables-Necessity of clock - Clocked RS flip flop circuit using NAND gates- Need for preset and clear inputs – Edge triggered D flip flop - Circuit of Clocked JK flip flop -Race around condition- Master slave JK flip flop circuit - clocked T flip flops - Symbols of above Flip Flops-Applications for each type of flip flop- Need for a Register - Types of registers- 4 bit shift left and shift right registers - 4-bit bi-directional shift Register –SISO, SIPO, PISO, PIPO Shift Registers - Applications of shift registers.

**UNIT6–COUNTERS AND MEMORIES** **Duration: 10 Periods (L: 8– T: 2)**

Synchronous and asynchronous counters - 4-bit asynchronous counter - Asynchronous decade counter with a circuit - 4-bit synchronous counter– asynchronous 4 bit up-down counter -Ring counter- applications - Types of memories - Memory read operation, write operation, access time, memory capacity, word length- ROM and RAM- Diode ROM - EEPROM and UVPROM- Dynamic MOS RAM cell- static RAM and dynamic RAM- Applications of Flash ROM.

## Reference Books


1. Digital Design by Morris mano
2. Digital Computer Electronics by Malvino and leach. 3rdedition Tata McGraw-Hill Education
3. Modern Digital Electronics By RP JAIN TMH
4. Digital Electronics: Principles & Applications by Roger L. Tokheim -McGraw-Hill Education, 2008
5. Digital Electronics by GK Kharate, Oxford University Press.


## Suggested E-learning references

1. www.nptel.com
2. www.electronics4u.com

## Suggested Learning Outcomes

**Upon completing this course, the student will be able to**

**CO1: Comprehend Number Systems and Binary Codes**

1.1 Explain Binary, Octal, Hexadecimal number systems.
1.2 Compare the above with Decimal system.
1.3 Convert a given decimal number into Binary, Octal, and Hexadecimal numbers and vice versa.
1.4 Convert a given binary number into octal and hexadecimal number system and vice versa.
1.5 Perform binary addition, subtraction, Multiplication and Division.
1.6 Write 1's complement and 2's complement numbers for a given binary number.
1.7 Perform subtraction of binary numbers in 1's complement method.
1.8 Perform subtraction of binary numbers in 2's complement method.
1.9 State the use of weighted and Un-weighted codes and list the types.
1.10 Write BCD code for the given Decimal number.
1.11 Write Excess – 3 codes for given Decimal number.
1.12 Convert a given binary number into Gray code and vice-versa.
1.13 Explain the use of alphanumeric codes (ASCII & EBCDIC)
1.14 State the importance of parity Bit.

**CO2: Analyze logic gates and simplify Boolean functions using Boolean laws and Karnaugh map**

2.1 State different postulates in Boolean algebra.
2.2 Explain the basic logic gates AND, OR, NOT gates with truth table.
2.3 Explain the working of universal logic gates (NAND, NOR gates) using truth tables.
2.4 Explain the working of an exclusive – OR gate with truth table.
2.5 Realize AND, OR, NOT operations using NAND, NOR gates.
2.6 Realize exclusive – OR gate using basic gates.
2.7 Realize exclusive – OR gate using NAND, NOR gates.
2.8 Realize exclusive – NOR gate using NAND, NOR gates.

2.9 State and prove De-Morgan's theorems.
2.10 Apply De-Morgan's theorems related postulates to simplify Boolean expressions (up to four variables).
2.11 Explain Standard forms of Boolean function (SOP, POS)
2.12 Write Boolean expressions for given truth table and draw the circuit.
2.13 Use Karnaugh map to simplify Boolean Expression (up to 4 variables only) in SOP form.
2.14 Use Karnaugh map to simplify Boolean Expression (up to 4 variables only) in POS form.

**CO3: Design combinational circuits - I**

3.1 Define combinational logic circuit.
3.2 Define half adder circuit and write its truth table.
3.3 Write the output expression and draw half adder circuit using basic gates.
3.4 Realize a Half-adder using i) NAND gates only and ii) NOR gates only.
3.5 Explain the operation of full adder circuit with truth table.
3.6 Realize full-adder using two Half-adders and an OR – gate.
3.7 Explain the operation of Half subtractor with truth table
3.8 Explain the operation of Full subtractor with truth table.
3.9 Explain the working of 4 Bit parallel adder circuit using full adders.
3.10 Explain 2's compliment parallel adder/ subtractor circuit.
3.11 Explain the working of a serial adder circuit.
3.12 Compare the performance of serial and parallel adder.

**CO4 –Design combinational circuits - II**

4.1 Define multiplexer and de-multiplexer.
4.2 Draw the circuit of 4 X 1 Multiplexer and explain its operation.
4.3 Mention applications of multiplexer.
4.4 Draw the circuit of 1 X 4 de- Multiplexer and explain its operation.
4.5 Mention applications of De-multiplexer.
4.6 Draw the circuit of 8 X 3 encoder and explain its operation.
4.7 Mention applications of Encoder.
4.8 Draw the circuit of 3 X 8 decoder and explain its operation.
4.9 Draw the circuit of BCD to decimal decoder explain its operation.
4.10 Mention applications of decoder.
4.11 State the need for a tri-state buffer.
4.12 List the two types of tri-state buffers with IC numbers.
4.13 Draw the circuit of 1-bit digital comparator (Magnitude comparator) andexplain its operation.
4.14 Write the IC numbers of4 X 1 Multiplexer, 1 X 4 De-multiplexer,3 X 8 Decoder,8 X 3 Encoder.

**CO5-Analyse flip flops and registers.**

5.1 Define a Sequential logic circuit.
5.2 State the necessity of clock.
5.3 Distinguish between combinational and sequential circuits
5.4 Explain RS Latch using NAND gates only and NOR gates only with Truth Tables.
5.5 Explain different types of Triggering in Flip Flops
5.6 Explain clocked RS flip flop using NAND gates.
5.7 Explain the level clocked D flip flop using NAND gates

5.8 State the need for preset and clear inputs.
5.9 Explain the circuit of JK flip flop using NAND gates with truth table.
5.10 What is race around condition in JK flip-flop and give methods to avoid it.
5.11 Explain the working of master slave JK flip flop circuit with necessary diagrams.
5.12 Explain the operation of T flip flop using JK flip flop and give truth tables.
5.13 List commonly used IC numbers of flip flops of each type.
5.14 List applications for each type of flip flop.
5.15 State the need for a Register
5.16 Explain the working of 4-bit shift left and shift right registers with a circuit and timing diagram.
5.17 Explain the working of 4-bit bi-directional shift register with a circuit and timing diagram.
5.18 Explain the working of SISO, SIPO, PISO, PIPO shift registers.
5.19 List applications of shift registers.
5.20 List commonly used IC numbers of registers.

**CO6 : Design counters and comprehend memories.**

6.1 Define a counter and modulus of a counter.
6.2 Distinguish between synchronous and asynchronous counters.
6.3 Explain the working of 4-bit asynchronous up counter with a circuit and Timing diagram.
6.4 Explain the working of asynchronous 4 bit up-down counter with a circuit and Timing diagram
6.5 Explain the working of 4-bit synchronous counter with a circuit and Timing diagram.
6.6 Explain the working of decade counter with a circuit and Timing diagram.
6.7 List applications of counters.
6.8 List commonly used IC numbers of counters.
6.9 Explain the working of ring counter.
6.10 List applications of ring counter.
6.11 State the need for memory in digital circuits.
6.12 Define the terms memory read operation, write operation, access time, memory capacity and word length.
6.13 Classify various types of memories based on principle of operation, physical characteristics, accessing modes and fabrication technology.
6.14 Differentiate between ROM and RAM.
6.15 Explain the working of diode ROM.
6.16 Distinguish between EEPROM and UVPROM.
6.17 Explain the working of basic dynamic MOS RAM cell.
6.18 Compare static RAM and dynamic RAM.
6.19 State the need for Flash ROM.
6.20 List the applications of Flash ROM.

## Suggested Student Activities

1. Learn how to Test the digital IC's and submit a report.

2. Propose how to manage the e-waste.

3. Perform trouble shooting of the not working equipment in the lab.

4. Learn the latest CMOS IC equivalents of the TTL ICs.

5. Prepare a simple PCB to perform verification of truth table for basic gates.

6. Prepare a PPT on the day-to-day application of the gates you have studied.

**CO-PO, PSO Matrix:**

| | Basic and Discipline Specific Knowledge | Problem Analysis | Design/Development of Solutions | Engineering Tools, Experimentation and Testing | Engineering Practices for Society, Sustainability and Environment | Project Management | Lifelong Learning | Linked PO |
|---|---|---|---|---|---|---|---|---|
| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO 7 | |
| CO1 | 2 | 2 | - | - | - | - | - | 1,2 |
| CO2 | 2 | 2 | 2 | - | - | - | 1 | 1,2,3,7 |
| CO3 | 1 | 2 | 2 | - | - | 1 | - | 1,2,3,6 |
| CO4 | 1 | 3 | 2 | - | - | 1 | 1 | 1,2,3,6,7 |
| CO5 | 2 | 1 | 2 | - | - | 1 | 1 | 1,2,3,6,7 |
| CO6 | 1 | 3 | 2 | - | - | 1 | 2 | 1,2,3,6,7 |

**C-24 III SEMESTER**

**EC-302 DIGITAL ELECTRONICS**
**MODEL PAPER MID-I**

IME: 1HOUR MAX.MARKS:20

PART-A

Answer ALL questions. 4 x1=4M

1. Convert the binary number 1101101 into its decimal equivalent.

2. Define 1's complement of a binary number.

3. Draw the logic symbol of AND and OR gates.

4. Define minterm.

PART-B

Answer ALL questions. 4 x1=4M

5(b) State the importance of parity bit.

6(a) State different postulates of Boolean algebra.

**OR**

6(b) Realize EX-OR gate using NAND gates only.

**PART–C**

Answer ALL questions. 2 x5 =10 M

7(a) Explain the working of universal logic gates NAND and NOR with truth tables.

**OR**

7(b) Simplify theBooleanexpressionusingDe-Morgan'stheoremsanddrawitssimplified logic circuit.

$A\underline{B}CD+B\underline{A}CD+CB\underline{A}D$+ABCD+$B\underline{C}AD$

8(a) Explain the use of Alphanumeric codes ASCII and EBCDIC

**OR**

8(b) Compare different Number systems.

**C-24 IIISEMESTER**

**EC-302: DIGITALELECTRONICS**
**MODEL PAPER MID- II**

TIME: 1HOUR MAX.MARKS:20

PART-A

AnswerALLquestions. 4 x1=4M

1. Definecombinationallogic circuit.
2. Drawthe circuitoffulladderusinghalf adders.
3. Definea multiplexer.
4. WriteICnumbers ofmultiplexers.

**PART–B**

AnswerALLquestions. 2 x3 =6 M

5(a)Explainthe operationoffulladderwithatruth table.

**OR**

5(b)Compareserialadderandparalleladder.

6(a) Write the truth table of1 x 4 de-multiplexer.

**OR**

6(b)Write any3 applications foreachofMUXand decoders.

**PART–C**

AnswerALLquestions. 2 x5 =10 M

7(a)Explain theworking of 4-bitparalleladder usinghalfadders.

**OR**

7(b)Explain2’scomplementparalleladder/subtract circuit.

8(a)Writethetruthtableof4 X1 multiplexeranddrawits circuit.

**OR**

8(b)Explainthe workingofBCD todecimaldecoder circuit.

**C-24 IIISEMESTER**

**EC-302: DIGITAL ELECTRONICS**

**MODELPAPER-SEMESTERENDEXAMINATION**

TIME: 2HOURS MAX.MARKS :40

PART-A

AnswerALLquestions.8 x1=8M

1. Stateany2 postulatesof Booleanalgebra.
2. Defineade-multiplexer.
3. Whatisedge-triggeringwithreferenceto clock.
4. DrawthesymbolofDandT flip-flop
5. Listany2ICnumbersofJKflip-flop.
6. Definemodulus ofa counter.
7. Definememoryaccesstime.
8. Define 2's complement of binary number

**PART–B**

Answer ALL questions. 4x3=12M 9(a) State and prove DE Morgan'sTheorems.

**OR**

9(b)Explain clockedSR flip flopusingNANDgates

10(a)RealizeahalfadderusingNAND gates only.

**OR**

10(b)Distinguishbetween synchronousandasynchronous counters.

11(a)Write thelogicsymbol and negativeedgetriggered truthtable of D flip-flop.

**OR**

11(b)Statetheneedofaregisterandlistitstypes.

12(a) Draw the circuit of a decade counter.

OR

12(b)DifferentiatebetweenROMand RAM.

**PART–C**

AnswerALLquestions.2 x5 =10

13(a) Simplify the Boolean expression ∑M(1,3,6,8,14,15) using K- map and draw its simplified logic circuit.

**OR**

13(b)Explaintheworkingof4-bit left shift registerwithacircuitandtiming diagram.

14(a)Explain theworkingof 4-bitbit parallel adderusingfull adders.

**OR**

14(b)Explain the workingof diodeROM.

15(a)Explaintheworkingof parallel-inandparallel-out register with timing diagram.

**OR**

15(b)Explain theworkingofmaster slaveJKflip-flop circuitwith necessarydiagrams.

16(a)Explain Dynamic RAM

**OR**

16(b)Explain Ring Counter with timing diagrams.

# EE-303 : D.C MACHINES & BATTERIES

| | | | |
|---|---|---|---|
| Course Title: | **D.C Machines & Batteries** | Course Code | **EE-303** |
| Semester | **III Semester** | Course Group | **Core** |
| Teaching Scheme in Periods (L:T:P) | **60:15:0** | Credits | **2.5** |
| Methodology | **Lecture + Tutorials** | Total Contact Periods | **75** |
| CIE | **60 Marks** | SEE | **40 Marks** |

## Pre requisites

This course requires the knowledge of basic principles of electricity and magnetism.

## Course Outcomes

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

| | |
|---|---|
| CO 1 | Describe the construction and working of D.C Generator |
| CO 2 | Compare the performance characteristics of D.C Generators |
| CO 3 | Explain the working of D.C Motors and Calculate efficiency |
| CO 4 | Explain Starters, the performance characteristics of D.C Motors and different methods of control speed |
| CO 5 | Determine the performance of DC Motors by conducting tests on DC Motor and enumerate braking methods of D.C Motor |
| CO 6 | Use different types of Batteries |

## Blue Print of Marks for SEE

<table>
<tr><th rowspan="2">Unit No</th><th rowspan="2">Unit Name</th><th rowspan="2">Periods</th><th colspan="3">Questions to be set for SEE</th></tr>
<tr><th colspan="2">R</th><th>U</th><th>A</th></tr>
<tr><td>1</td><td>Fundamentals of D.C Generators</td><td>14</td><td rowspan="6">Q4</td><td rowspan="2">Q1</td><td rowspan="2">Q9(a)</td><td rowspan="2">Q13(a)</td></tr>
<tr><td>2</td><td>Armature Reaction and Characteristics of D.C Generator</td><td>11</td></tr>
<tr><td>3</td><td>Fundamentals of D.C Motors</td><td>15</td><td rowspan="2">Q2</td><td rowspan="2">Q10(a)</td><td rowspan="2">Q14(a)</td></tr>
<tr><td>4</td><td>Starters, Characteristics, Applications of D.C Motors and Speed control</td><td>13</td></tr>
<tr><td>5</td><td>Testing and Braking of D.C Motors</td><td>12</td><td rowspan="2">Q3</td><td>Q5,Q6</td><td>Q9(b), Q11(a), Q11(b)</td><td>Q13(b), Q15(a), Q15(b)</td></tr>
<tr><td>6</td><td>Batteries</td><td>10</td><td>Q7,Q8</td><td>Q10(b), Q12(a), Q12(b)</td><td>Q14(b), Q16(a), Q16(b)</td></tr>
<tr><td colspan="2">Total</td><td>75</td><td colspan="2">8</td><td>8</td><td>8</td></tr>
</table>

## Course Contents

**UNIT 1- Fundamentals of D.C Generators** **Duration: 14 Periods (L: 11 - T: 3)**

Dynamically induced E.M.F- Fleming's right hand rule - electromechanical energy conversion - working principle of D.C generator - simple loop generator – construction and functions of each part of D.C generator with neat sketches - Lap and Wave windings – - E.M.F equation - Classification of generators based on excitation- Voltage and Current equations of different types of D.C Generators with schematic diagrams– power stages of DC generator - losses in D.C machines- efficiency –condition for maximum efficiency - simple problems

**UNIT 2 - Armature Reaction and Characteristics of D.C Generator**

**Duration: 11 Periods (L:9 - T: 2)**

Armature reaction, Formula for Demagnetization & Cross magnetization $AT_d$ per pole and ATc per pole- simple problems-commutation –methods of improving commutation- O.C.C, internal, external characteristics of Separately excited, Shunt, Series and Compound generators- Conditions for building up of EMF – reasons for not building up of E.M.F. - - parallel operation of generators - Applications of D.C generators – Welding Generator.

**UNIT 3– Fundamentals of D.C Motors** **Duration: 15 Periods (L:12 - T:3)**

Fleming's left hand rule - working of D.C motors – significance of back E.M.F.-classification of DC motors- Connection diagrams, voltage and current equations for different D.C motors-Problems – Torque equation-Armature torque ($T_a$) , shaft torque ($T_{sh}$) and loss torque($T_L$ )–Problems on Torque-Different losses-power stages-efficiency-Simple Problems on losses and efficiency.

**UNIT4 : Starters, Characteristics , Applications of D.C Motors And Speed control**

**Duration: 13 Periods (L: 11– T:2)**

Necessity of starter- 3-point starter, 4-point starter. Electrical and mechanical characteristics of D.C Shunt, Series and compound motors-Applications of D.C motors, Necessity of speed control- Speed controls for D.C shunt motors (flux control, armature voltage control and voltage control methods) - advantages and disadvantages -methods of speed control for DC series motors- problems

**UNIT 5 : Testing and braking of D.C Motors** **Duration: 12 Periods (L: 10 – T:2)**

Brake test on D.C. Motors- Performance curves- Swinburne's Test-advantages and disadvantages-problems. Types of braking – Advantages of Electrical braking- methods of Electrical braking-Plugging, Rheostatic braking and Regenerative braking applied to DC shunt and DC series motors

**UNIT 6 : Batteries** **Duration:10 Periods (L:8 T:2)**

Classification of cells - primary cells and secondary cells - construction of Lead acid cell - chemical reaction during charging and discharging of lead acid cell - applications - charging of Batteries – precautions during charging and discharging - trickle charging - indications of fully charged battery - capacity of a battery - factors affecting the capacity of the battery - Ampere-Hour efficiency - Watt-Hour efficiency - problems - - Lithium-ion cell- applications - super capacitor - applications - maintenance free battery – applications - methods of disposing batteries.

**Reference Books**

1. Electrical Technology by H.Cotton

2. Electrical Technology –Vol –I by B.L.Theraja.

3. Electrical Technology –Vol –II by B.L.Theraja.

4. Electrical Machines by P.S.Bhimbhra

5. Electrical Machines by M.V.Deshpande

6. Electrical Machines by JB Gupta

## Suggested E-learning references

1. http://electrical4u.com/

2. https://nptel.ac.in/syllabus/108106070/

3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/

4. https://nptel.ac.in/courses/108108076/

5. https://nptel.ac.in/courses/108105053/

## Suggested Learning Outcomes

**Upon completion of the Course ,the student shall be able to**

**CO1 - Describe the construction and working of D.C Generator**

**1.1** Define dynamically induced E.M.F.

1.2 State Fleming's right hand rule.
1.3 Define Electromechanical energy conversion.
1.4 State principle of working of D.C generator.
1.5 Explain the working of simple loop generator.
1.6 Describe the construction of DC generator
1.7 State the functions of each part of D.C generator with neat sketches.
1.8 Describe the working of D.C Generator.
1.9 List the types of windings of D.C Machine (i) Lap (ii) Wave.
1.10 Compare lap winding and wave winding
1.11 Derive the E.M.F equation of D.C generator.
1.12 Solve simple problems on E.M.F equation.
1.13 Classify generators based on excitation.
1.14 Write voltage and current equations for different types of D.C Generators with schematic diagrams.
1.15 Explain power stages in D.C. machine
1.16 List the losses incurred in the D.C machines.
1.17 Define efficiency of DC Generator
1.18 Derive the condition for maximum efficiency.
1.19 Solve problems on losses and efficiency.

**CO2 - Compare the performance characteristics of D.C Generators**

2.1 Define armature reaction.
2.2 Describe the armature reaction with sketches.
2.3 Describe the phenomenon of demagnetization &cross magnetization.
2.4 Write the formula for ATd , ATc / Pole.
2.5 Solve simple problems on ATd , ATc / Pole .
2.6 Define Commutation.
2.7 List the methods to improve commutation.
2.8 Draw and explain O.C.C, internal and external characteristics of Separately excited generator
2.9 Draw and explain O.C.C, internal and external characteristics of Shunt generator.
2.10 Draw and explain O.C.C, internal and external characteristics of Series generator
2.11 Draw and explain O.C.C, internal and external characteristics of Compound generators.
2.12 List the conditions for building up of EMF and reasons for not building up of E.M.F in DC generators.
2.13 Explain the necessity of parallel operation of DC generators.
2.14 List the conditions for parallel operation of generators.
2.15 State the use of equalizer ring in parallel operation.
2.16 List the applications of D.C generators.
2.17 Describe the working of welding generator with a sketch.

**CO3 - Explain the working of D.C Motors and Calculate efficiency**

3.1 State Fleming's left hand rule.
3.2 Describe the working of D.C motors
3.3 Write the significance of back E.M.F and its formula.
3.4 Classify D.C motors.
3.5 Write voltage and current equations for different D.C motors.
3.6 Solve problems on back E.M.F
3.7 Derive torque equation of D.C motor.
3.8 Develop the formulas for armature torque ($T_a$), shaft torque ($T_{sh}$) and loss torque($T_L$).
3.9 Solve problems on torque.
3.10 Explain power stages in D.C. motor.
3.11 List the different losses in D.C motor.
3.12 Define efficiency of D.C motor
3.13 Solve Simple problems on losses and efficiency.

**CO4 - Explain Starters , the performance characteristics of D.C Motors and different methods of control speed**

4.1 State the necessity of starter.
4.2 Describe the construction and working of 3-point starter with neat sketch.
4.3 Describe the construction and working of 4-point starter with neat sketch.
4.4 Draw and explain the electrical characteristics of D.C Shunt motor.
4.5 Draw and explain the mechanical characteristics of D.C Shunt motor
4.6 Draw and explain the electrical characteristics of D.C Series motor.
4.7 Draw and explain the mechanical characteristics of D.C Series motor

4.8 Draw and explain the electrical characteristics of D.C compound motor (cumulative and differential compound )

4.9 Draw and explain the mechanical characteristics of D.C compound motor (cumulative and differential compound).

4.10 List the applications of D.C motors

4.11 State the need of speed control of DC Motors.

4.12 List the different methods of speed controls for D.C shunt motors.

4.13 Describe the speed control of D.C shunt motor by flux control method

4.14 Describe the speed control of D.C shunt motor by armature control method

4.15 Describe the speed control of D.C shunt motor by voltage control method

4.16 List the advantages and disadvantages of various speed control methods of D.C Shunt Motor.

4.17 Solve problems on speed control of DC shunt motor

4.18 List the different methods of speed control for D.C series motors.

4.19 Describe the speed control methods of D.C series motor.

4.20 List the advantages and disadvantages of speed control methods of D.C series motor.

4.21 Solve problems on speed control of DC series motor

**CO5 - Determine the performance of DC Motors by conducting tests on DC Motor and enumerate braking methods of D.C Motor**

5.1 Describe the method of conducting brake test on D.C shunt motor with neat sketch

5.2 Describe the method of conducting brake test on D.C series motor with neat sketch

5.3 Describe the method of conducting brake test on D.C compound motor with neat sketch

5.4 Explain different performance curves.

5.5 List the advantages and disadvantages of brake test on different types of D.C Motors.

5.6 Solve problems on brake test on different types of D.C Motors.

5.7 Describe the method of conducting Swinburne's test.

5.8 Solve problems on Swinburne's test

5.9 List the advantages and disadvantages of Swinburne's test.

5.10 State the necessity of braking

5.11 List the types of braking

5.12 State the advantages of electrical braking

5.13 List the types of electrical braking

5.14 Explain plugging in DC shunt motor and DC series motor

5.15 Explain rheostatic or dynamic braking in DC shunt and series motor

5.16 Explain the concept of regenerative braking in DC shunt and DC series motor

**CO6 - Use different types of Batteries**

6.1 Classify cells

6.2 Define primary cells and secondary cells

6.3 Compare primary and secondary cells

6.4 State types of storage cells

6.5 Describe the construction of Lead acid cell.

6.6 Write chemical reactions during charging and discharging of lead acid cell

6.7 List the applications of Lead acid cell
6.8 Describe charging of Batteries by a) Constant current method b) Constant voltage method
6.9 List the precautions during charging and discharging.
6.10 Define trickle charging
6.11 List the indications of full charged battery.
6.12 Define capacity of a battery
6.13 List the factors affecting the capacity of the battery
6.14 Define a) Ampere-Hour efficiency and b)Watt- Hour efficiency
6.15 Solve problems on the Ampere-Hour efficiency and Watt-Hour efficiency
6.16 Describe the construction of Lithium-ion cell.
6.17 Write chemical reaction during charging and discharging of Lithium-ion battery
6.18 Give the applications of Lithium-ion cell
6.19 State the importance of super capacitor
6.20 List the applications of super capacitor
6.21 Define maintenance free battery.
6.22 List the applications of maintenance free batteries
6.23 List different methods of disposing batteries.

## Suggested Student Activities

1. Prepare charts on types of starters used for various DC motors clearly labeling the parts.
2. Visit nearby shop or show room which sells batteries and inverters (UPS) and prepare a report on the observations made during visit.
3. Identify a faulty battery and service the same using standard tools.
4. Prepare a report of the conditions of batteries available in the Institute.
5. For given voltage, current, Ah ratings of individual cell, and required voltage and current rating of battery, prepare a report of calculations for number of cells and their method of connections.
6. Visit any industry and write a report on the DC machines used in that industry
7. Prepare a chart on DC motor speed control techniques
8. Make charts of various types of DC motors and generators, electrical equivalent circuit diagrams clearly indicating voltages and currents flowing in the machine. Also write the formulae of armature current, field current, line or load current, terminal voltage and back emf or induced emf
9. Quiz
10. Group discussion
11. Surprise test.

**CO-PO Mapping Matrix**

| | Basic and discipline specific knowledge | Problem analysis | Design / development of solutions | Engineering Tools, Experimentation and Testing | Engineering practices for society sustainability and environment | Project Management | Lifelong learning | Linked PO |
|---|---|---|---|---|---|---|---|---|
| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | |
| CO1 | 3 | 1 | | | | | 1 | 1,2,7 |
| CO2 | 3 | 1 | | 3 | | | 1 | 1,2,4,7 |
| CO3 | 3 | 1 | | | | | 1 | 1,2,7 |
| CO4 | 3 | 1 | 1 | 3 | | | 1 | 1,2,3,4,7 |
| CO5 | 3 | 1 | | 3 | | | 1 | 1, 2,4,7 |
| CO6 | 3 | 1 | | | 3 | | 1 | 1,2,5,7 |

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**
**MODEL QUESTION PAPER**
**DEEE III SEMESTER MID -I EXAMINATION**

**Course Code: EE-303** **Duration:1 hour**
**Course Name: DC Machines & Batteries** **Max.Marks:20**

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## PART-A

Answer **all** questions, Each Question carries one-mark **4x1 = 4 Marks**

1. State the working principle of DC generator
2. State different parts in a DC generator
3. State the effects of armature reaction in a DC generator?
4. Write the formula for $AT_d$ and $AT_c$/Pole

## PART-B

Answer two questions. Each question carries three marks **2x 3 = 6 Marks**

5 a) Draw the power flow diagram of a DC generator.

OR

b) Compare lap winding and wave winding in any three aspects.

6. a) List the conditions to be satisfied for parallel operation of dc generators?

OR

b) Define commutation and list the methods to improve it.

## PART-C

Answer two questions. Each question carries five marks **2x 5 = 10 Marks**

7. a) A long shunt compound generator delivers a load current of 400A at a terminal voltage of 250V. The armature resistance, series field and shunt field resistances are 0.04 ohm, 0.01 ohm and 125 ohms respectively. Calculate the generated emf and armature current. Allow 1 V per brush contact drop.

OR

b) Derive the EMF equation of a DC Generator.

8. a) Explain the OCC of self-excited DC generator

OR

b) Describe the working of welding generator.

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**
**MODEL QUESTION PAPER**
**DEEE III SEMESTER MID -II EXAMINATION**

**Course Code: EE-303** **Duration:1 hour**
**Course Name: DC Machines & Batteries** **Max.Marks:20**

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## PART-A

Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

1) State the types of DC motors
2) State the losses in DC motors
3) Draw the torque Vs armature current characteristics for a D.C shunt motor.
4) List any two applications of D.C shunt motor

## PART-B

Answer **two** questions. Each question carries three marks **2x 3 = 6 Marks**

5. a) Write the significance of back E.M.F and its formula in DC motors

OR

b) Draw the circuit diagram of DC shunt motor and write the voltage and current equations.

6 a) State the function of Hold on coil and over load release of a 3-point starter

OR

b) Draw the circuit diagram of speed control of DC shunt motor by field control method.

## PART-C

Answer two questions. Each question carries five marks **2x 5 = 10 Marks**

7 a) Derive the torque equation of a D.C Motor

OR

b) A 440 V shunt motor has armature resistance of 0.8 ohm and field resistance of 200 ohms. Determine the back e.m.f when giving an output of 7.46 KW at 85% efficiency.

8. a) Draw 3 point starter and label the parts.

OR

b) Explain the speed control methods of DC series motor

(a)Field Diverter,

(b)Tap changing.

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**MODEL QUESTION PAPER**
**DEEE III SEMESTER**
**SEMESTER END EXAMINATION**

**Course Code: EE- 303** **Duration:2 hours**
**Course Name: DC Machines & Batteries** **Max.Marks:40Marks**

---

## PART-A

Answer **all** questions 8x1 =8 Marks

1) Define armature reaction.
2) State the types of DC motors.
3) State any two tests on DC motor.
4) State any two applications of DC series motor.
5) Define Plugging.
6) State the methods electrical braking.
7) List any two applications of Lithium- ion cell.
8) Define trickle charging.

## PART-B

Answer **four** questions **4 x 3 = 12 Marks**

9. a) Draw the circuit diagram to conduct OCC of a DC separately excited generator and its characteristic curve.

OR

b) State the requirement of good braking system.

10. a) Draw Electrical and Mechanical characteristics of DC series motor.

OR

b) List any three applications of maintenance free batteries.

11. a) State any three advantages of Swinburne's test in DC motors

OR

b) State any three advantages of Electric Braking.

12. a) Compare Primary cells and secondary cells in any three aspects.

OR

b) List the indications of fully charged battery.

## PART-C

Answer **four** questions 4 **x 5 = 20 Marks**

13. a) A 10KW, 250 V DC shunt generator has total iron and friction losses of 600W. Its armature and shunt field resistances are 0.5Ω and 125Ω respectively. Calculate efficiency at rated load.

OR

b) Explain the method of conducting Break test on DC Shunt motor.

14. a) Draw the connection diagram of a 3 point starter and indicate the parts.

OR

b) Write the chemical reaction during charging and discharging of Lead –Acid cell.

15. a) The following readings are obtained during the brake test of DC shunt motor.
Spring balance readings = 10 Kg and 35 Kg, Diameter of the drum = 40 cm
Speed of the motor = 950 rpm Applied voltage = 200 V Line current = 30 A
Calculate the output and efficiency.

OR

b) Explain the Plugging method of Electrical braking in DC shunt motor.

16.a) Explain the charging of a battery by constant voltage method.

OR

b) A lead acid cell is discharged at a steady current of 5A for 11 hours. The average terminal voltage being 1.8 V. To restore it to its original state of charge a current of 3A for 30 hours is required, the average terminal voltage being 2.2V. Calculate the ampere hour efficiency(AH) and watt hour efficiency(WH).

# EE-304 : ELECTRICAL CIRCUITS

| | | | |
|---|---|---|---|
| Course Title: | **Electrical Circuits** | Course Code | **EE-304** |
| Semester | **III Semester** | Course Group | **Core** |
| Teaching Scheme in Periods (L:T:P) | **60:15:0** | Credits | **2.5** |
| Methodology | **Lecture + Tutorials** | Total Contact Periods | **75** |
| CIE | **60 Marks** | SEE | **40 Marks** |

## Pre requisites

This course requires the knowledge of Basic electrical engineering.

## Course Outcomes

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

| | |
|---|---|
| CO 1 | Apply Kirchhoff's laws and Star Delta transformations to Electrical circuits |
| CO 2 | Apply network theorems to solve DC circuits |
| CO 3 | Distinguish between the various terms pertaining to Alternating quantities |
| CO 4 | Solve problems on single phase A.C. series circuits |
| CO 5 | Solve problems on single phase A.C. parallel circuits |
| CO 6 | Solve problems on Poly phase balanced circuits |

## Blue Print of Marks for SEE

<table>
<tr><th rowspan="2">Unit No</th><th rowspan="2">Unit Name</th><th rowspan="2">Periods</th><th colspan="4">Questions to be set for SEE</th></tr>
<tr><th colspan="3">R</th><th>U</th><th>A</th></tr>
<tr><td>1</td><td>Kirchhoff’s Laws and Star - Delta Transformation</td><td>12</td><td rowspan="6">4</td><td colspan="2" rowspan="2">1</td><td rowspan="2">9(a)</td><td rowspan="2">13(a)</td></tr>
<tr><td>2</td><td>Network Theorems</td><td>13</td></tr>
<tr><td>3</td><td>Fundamentals of A.C circuits</td><td>10</td><td colspan="2" rowspan="2">2</td><td rowspan="2">10(a)</td><td rowspan="2">14(a)</td></tr>
<tr><td>4</td><td>Single phase A.C. Series Circuits</td><td>15</td></tr>
<tr><td>5</td><td>Single phase A.C. Parallel Circuits</td><td>14</td><td rowspan="2">3</td><td>5,6</td><td>9(b), 11(a), 11(b)</td><td>13(b), 15(a), 15(b)</td></tr>
<tr><td>6</td><td>Poly Phase Circuits</td><td>11</td><td>7,8</td><td>10(b), 12(a), 12(b)</td><td>14(b), 16(a), 16(b)</td></tr>
<tr><td colspan="2">Total</td><td>75</td><td colspan="3">8</td><td>8</td><td>8</td></tr>
</table>

## Course Contents

### UNIT 1 - Kirchhoff’s Laws and Star - Delta Transformation

**Duration: 12 Periods (L: 9 - T:3)**

Active and Passive circuits - Junction, branch and loop in circuits -Insufficiency of Ohm’s law to solve complex circuits, Kirchhoff’s laws – Mesh analysis - Star - Delta configurations, star-delta transformations.

### UNIT 2– Network Theorems

**Duration: 13 Periods (L: 10 – T: 3)**

Ideal Voltage source, Ideal current source- Source transformation technique-Superposition theorem- Thevenin’s Theorem -Norton’s Theorem- Maximum power transfer theorem with reference to D.C.-Solve Simple Problems on the above.

**UNIT 3 – Fundamentals of A.C** **Duration: 10 Periods (L: 8 – T: 2)**

Definition of Alternating quantity, cycle, time period, frequency, amplitude, instantaneous value and angular velocity - Average value - effective value/R.M.S value – form factor – peak factor - definitions and derivations - calculations of these values for sine wave, - Representation of alternating quantities by equation, graphs and phasor diagrams - Phase and phase difference– Understanding of `j' notation for alternating quantities ,transformation from polar to rectangular notations and vice-versa.

**UNIT 4 - Single phase A.C. Series Circuits** **Duration: 15 Periods (L: 12 – T: 3)**

Resistance, inductance and capacitance as circuit elements - concept of reactance, Derive the expression for voltage, current, impedance, power including waveforms and phasor diagrams in pure resistive, inductive and capacitive circuits - Derive the impedance, current, phase angle, power and power factor in R-L, R-C, L-C &R-L-C series circuits including phasor diagrams. Impedance triangle, phase angle, power factor, active and reactive components of power in above circuits – Definition of Resonance in series circuits and expression for resonant frequency-Q-factor-expression of Q- factor- problems on series resonance.

**UNIT 5 - Single phase A.C. Parallel Circuits** **Duration: 14 Periods (L:11 – T: 3)**

Derive the current (RMS Values)and Power factor, State expressions for impedance (RMS Values)power in R-L, R-C, L-C and R-L&C parallel circuits including phasor diagrams. – Solve simple problems on parallel circuits by vector method, Admittance method–Parallel RL and C resonance circuit –Condition for resonance in parallel circuit- Q-factor and resonance frequency-expressions

**UNIT 6 - Poly phase circuits** **Duration: 11 Periods (L:9 – T: 2)**

Definition of Poly phase - Advantages of poly-phase systems over single-phase systems - Generation 3 phase EMF's – Representation of 3 phase EMF's by equations, waveforms and phasor - phase sequence - Current in neutral of 3 phase system - phasor diagram showing relation between phase and line quantities, Relation between phase and Line values of voltages and currents – 3 phase power equation - Problems on 3 phase balanced circuits

**Reference Books**


1. Electrical Technology - Vol - I by B.L. Theraja- S.Chand&co.
2. Introduction to Electrical Engg. by V.K.Mehta
3. Electrical Technology by Hughes.
4. Problems in Electrical Engg. by Parker Smith

5. Engineering Circuit analysis by William Hayt and Jack E,kemmerly-TMH
6. Electrical Circuits by A.Chakraborthy- Dhanapat Rai and Sons
7. Network and Systems by D. Roy Chowdary- New age international publishers
8. Electric Circuit Theory by K. Rajeshwaran-Pearson educations,2004
9. Network Analysis by Van Valkenburg, PHI.
10. Electrical Circuits by Joseph Edminister- Schaum series
11. Fundamentals of Electric circuits – Alexander Sadiku- TMH
12. Electric circuits by Mahmood Nahvi, Joseph A Edminister-TMH.

## Suggested E-learning references

1. http://electrical4u.com/
2. www.nptel.ac.in
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/
4. http://www.freeengineeringbooks.com/electrical-books-download/Electrical-Engineering-basics.php
5. https://electrical-engineering-portal.com/theorems-network-reductions#circuit-theorems
6. https://nptel.ac.in/courses/108102042/
7. https://nptel.ac.in/courses/108108076/

## Suggested Learning Outcomes

**Upon completion of the subject, the student shall be able to**

**CO1: Apply Kirchhoff's laws and Star Delta transformations to circuits:**

1.1 Differentiate between active and passive circuits.
1.2 Define junction in circuits.
1.3 Define loop in circuits
1.4 Define branch in circuits
1.5 State the limitations of Ohm's law.
1.6 State Kirchhoff's current law
1.7 State Kirchhoff's voltage law.
1.8 Solve Simpleproblems by applying KVL and KCL (no dependent sources)
1.9 Explain Mesh analysis
1.10 Solve simple problems on mesh analysis.
1.11 Explain star and delta circuits
1.12 Explain the concept of circuit transformation and equivalent circuits
1.13 Develop transformation formulae for star- delta transformations
1.14 Solve problems on star- delta transformation

**CO2: Apply network theorems to solve DC circuits**

2.1 Define ideal voltage source
2.2 Define ideal current source
2.3 Explain source transformation technique
2.4 Solve simple problems on source transformation
2.5 State Superposition theorem.
2.6 State Thevenin's theorem.
2.7 State Norton's theorem
2.8 State maximum power transfer theorem.
    a. (All the theorems with reference to D.C only)
2.9 Derive the condition for maximum power transfer
2.10 Solve simple problems on network theorems

**CO3: Distinguish between the various terms pertaining to Alternating quantities**

3.1 Draw the different A.C waveforms.
3.2 Define alternating quantity
3.3 Define cycle of an alternating quantity
3.4 Define frequency of an alternating quantity
3.5 Define time period of an alternating quantity
3.6 Define amplitude of an alternating quantity
3.7 Define angular velocity of an alternating quantity
3.8 Define the instantaneous value of an alternating quantity
3.9 Define maximum value of an alternating quantity
3.10 Define Average value of an alternating quantity
3.11 Define R.M.S value of an alternating quantity
3.12 Define form factor of an alternating quantity
3.13 Define peak factor of an alternating quantity
3.14 Calculate the maximum value, average value, R.M.S value, form factor and peak factor of sine wave
3.15 State the expressions for maximum value, R.M.S value, form factor and Peak factor of Half wave rectified Sine wave, Full wave Rectified Sine wave, Triangular wave and Square wave.
3.16 Define the terms phase and phase difference (No problems).
3.17 Define j operator.
3.18 Convert polar quantities to rectangular quantities and vice-versa.

**CO4: Solve problems on Single phase A.C. series circuits**

4.1 Define the terms resistance, inductance and capacitance
4.2 Define reactance
4.3 Define active power, reactive power and apparent power
4.4 Mention the units of active power, reactive power and apparent power
4.5 Draw current, voltage waveforms, phasor diagram of pure resistive circuit
4.6 Derive the expression for voltage, current, impedance, power in pure resistive circuit
4.7 Draw current, voltage waveforms, phasor diagram of pure inductive circuit
4.8 Derive the expression for voltage, current, impedance, power in pure inductive circuit
4.9 Draw current, voltage waveforms, phasor diagram of pure capacitive circuit
4.10 Derive the expression for voltage, current, impedance, power in pure capacitive circuit
4.11 Draw current, voltage waveforms, phasor diagram, power triangle, impedance triangle of R-L series circuit
4.12 Derive the expression for voltage, current, impedance, power and power factor in R-L series circuit
4.13 Draw current, voltage waveforms, phasor diagram, power triangle, impedance triangle of R-C series circuit
4.14 Derive the expression for voltage, current, impedance, power and power factor in R-C series circuit
4.15 Draw current, voltage waveforms, phasor diagram, power triangle, impedance triangle of L-C series circuit
4.16 Derive the expression for voltage, current, impedance, power and power factor in L-C series circuit
4.17 Draw current, voltage waveforms, phasor diagram, power triangle, impedance triangle of R-L-C series circuit
4.18 Derive the expression for voltage, current, impedance, power and power factor in R-L-C series circuit
4.19 Solve simple problems on R-L, R-C, L-C, R-L-C series circuits
4.20 Define resonance in series circuits
4.21 State the condition for resonance in series circuit
4.22 Derive resonant frequency of single-phase series RLC circuit.
4.23 Solve simple problems on series resonance
4.24 Define Q- factor of single-phase series RLC circuit
4.25 Write the expression for Q-factor of single-phase series RLC circuit

**CO5: Solve problems on single phase A.C. parallel circuits**

5.1 List methods for solving Parallel Circuits
5.2 Draw phasor diagram of R-L parallel circuit
5.3 Derive the expression (RMS Values) for current and power factor in R-L parallel circuit by using Vector method.
5.4 State the expression for Impedanceand Power in R-L parallel circuit
5.5 Solve simple problems on R-L parallel circuits using Vector method
5.6 Draw phasor diagram R-C parallel circuit
5.7 Derive the expression (RMS Values) for current and power factor in R-C parallel circuit by using Vector method.
5.8 State the expression for Impedance and Power in R-C parallel circuit
5.9 Solve simple problems on R-C parallel circuits using Vector method
5.10 Draw phasor diagram of L-C parallel circuit
5.11 Derive the expression (RMS Values) for current and power factor in L-C parallel circuit by using Vector method.
5.12 State the expression for Impedance and Power in L-C parallel circuit
5.13 Draw phasor diagram of R-L&C parallel circuit
5.14 Derive the expression (RMS Values) for current and power factor in R-L&C parallel circuit by using Vector method.
5.15 State the expression for Voltage and Power in R-L&C parallel circuit
5.16 Solve simple problems on R-L and R-C parallel circuits by Admittance Method
5.17 Solve simple problems on R and R-L parallel circuits by Admittance Method
5.18 Define resonance in parallel circuits
5.19 State the condition for resonance in parallel circuit
5.20 State the expression for resonant frequency of Single phase parallel RL&C circuit.
5.21 Define Q- factor of single phase parallel RL&C circuit
5.22 State the expression for Q-factor of single phase parallel RL&C circuit

**CO6: Solve problems on Poly phase balanced circuits**

6.1 Define the term `Poly Phase'.
6.2 List the advantages of 3 phase system over single phase system.
6.3 Explain the method of generation of 3 phase emfs.
6.4 Write the expression for Poly phase emfs
6.5 Represent poly phase emfs by phasor diagram
6.6 Represent poly phase emfs by waveforms
6.7 Define phase sequence
6.8 Compute the current flowing in neutral conductor in 3-phase system

6.10 Derive the relation between line and phase values of current and voltage in 3 phase star circuit

6.11 Derive the relation between line and phase values of current and voltage in 3 phase delta circuits.

6.12 Derive the equation for power in 3 phase circuit.

6.13 Solve simple problems in three-phase system with balanced loads.

## Suggested Student Activities

1. Prepare a chart on various electrical circuit theorems and their practical applications.
2. Write a report on practical applications of Single phase AC circuits and Three phase AC circuits with their operating voltages and other electrical parameters.
3. Visit nearby Industry to familiarize with single phase and poly phase circuits
4. Quiz
5. Group discussion
6. Surprise test

## CO-PO Mapping Matrix

| | Basic and Discipline specific knowledge | Problem Analysis | Design/Development of Solutions | Engineering Tools | Engineering Practices for society, Sustainability | Project Management | Lifelong learning | Linked PO |
|---|---|---|---|---|---|---|---|---|
| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | |
| CO1 | 3 | 3 | 2 | 1 | | | 3 | 1,2,3,4,7 |
| CO2 | 3 | 3 | 2 | 1 | | | 3 | 1,2,3,4,7 |
| CO3 | 3 | 3 | | 1 | | | 3 | 1,2,4,7 |
| CO4 | 3 | 3 | | 1 | | | 3 | 1,2,4,7 |
| CO5 | 3 | 3 | | 1 | | | 3 | 1,2,4,7 |
| CO6 | 3 | 3 | | 1 | | | 3 | 1,2,4,7 |

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING,TELANGANA**
**MODEL QUESTION PAPER**
**DEEE III SEMESTER MID SEMESTER-I EXAMINATION**

**Corse Code:EE-304** **Duration:1 Hour**
**Course Name: Electrical Circuits** **Max.Marks:20**

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**PART-A**

**Answer all questions, Each Question carries one mark4x1 = 4 Marks**

1) State Kirchhoff's current law.
2) Define junction of an electrical network
3) What is an ideal voltage source?
4) State Thevenin's theorem.

**PART-B**

**Answer two questions. Each question carries three marks2x 3 = 6 Marks**

5) a) Find the magnitude and direction of the unknown currents in below circuit. Given i1 = 10A, i2 = 6A and i5 = 4A.

**OR**

b) Convert the below star network to an equivalent delta network if $R_1=R_2=R_3=2\Omega$ .

6) a) State how to convert a voltage source to current source with an example.

**OR**

b) State superposition theorem.

**PART-C**

**Answer two questions. Each question carries five marks2x 5 = 10 Marks**

7) a) Find the equivalent resistance between X and Y for the circuit shown below

**OR**

b) Find the current through 8Ω resistor for the network shown below by using Kirchhoff's law.

8) a) Determine the current through 10Ω resistor of the network shown below by using Norton theorem.

**OR**

b) Find the value of $R_L$ for the given network below so that the power drawn by $R_L$ is maximum.

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**MODEL QUESTION PAPER**
**DEEE III SEMESTER MID SEMESTER-II EXAMINATION**

**Corse Code:EE-304** **Duration:1 Hour**
**Course Name: Electrical Circuits** **Max.Marks:20**

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**PART-A**

**Answer all questions, Each Question carries one mark4x1 = 4 Marks**

1) Define form factor
2) Convert 3+j4 to polar quantity.
3) Draw the power triangle of single phase series RC circuit .
4) Draw the phasor diagram of pure inductor.

**PART-B**

**Answer two questions. Each question carries three marks2x 3 = 6 Marks**

5) a) Give the expression of rms value and average value of sine wave.

**OR**

b) Define the phase and phase difference of alternating quantities.

6) a) Give the expressions of impedance and power factor of single phase series RL circuit.

**OR**

b) Give the expressions of Q-factor and resonant frequency of single phase series circuit.

**PART-C**

Answer two questions. Each question carries five marks **2x 5 = 10 Marks**

7) a) Derive the expression for RMS value and average value of sine wave.

**OR**

b) Convert rectangular to polar and vice-versa
i) 2+j3 ii)6-j6 iii) 6<30° iv) 2<-90°

8) a) Derive the expression for resonant frequency of a series RLC circuit.

**OR**

b) A coil having resistance of 7Ω and inductance of 30 mH is connected to 230V, 50 Hz single phase supply. Calculate the circuit current and power factor.

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**MODEL QUESTION PAPER**
**DEEE III SEMESTER**
**SEMESTER END EXAMINATION**

**Corse Code:EE-304** **Duration:2 hours**
**Course Name: Electrical Circuits** **Max.Marks:40Marks**

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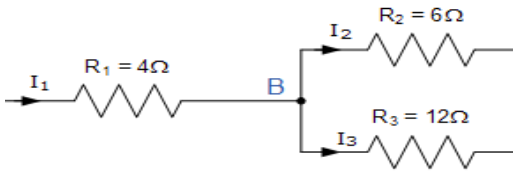
## PART-A

Answer **all** questions 8**x1 =8 Marks**

1) Find the current $I_2$ in the below circuit given $I_1$= 10 A and $I_3$ = 7A.

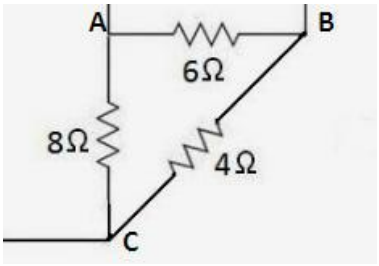



2) Define a) Average value and b) RMS value.
3) Write the voltage and current relationships in a three phase circuits for a star connected balanced load.
4) What is the current through a capacitor C= 10nF connected to a single phase 50V, 50Hz voltage source?
5) Define Q-factor.
6) State the condition for resonance in parallel circuits.
7) Define the term polyphase.
8) State any two advantages of 3 phase system over single phase system.

## PART-B

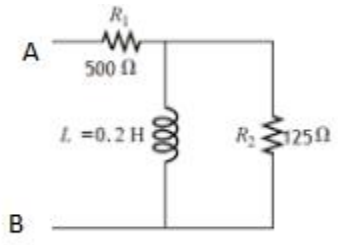
Answer four questions **4 x 3 = 12 Marks**

9) a) Transform the given delta network to star.



**OR**

b) Find the impedance between A and B in the below circuit when it is energized by v(t) = 100sin314t Volts.




10 a) Determine the average value, RMS value and form factor of single phase AC 230 V, 50Hz full wave rectified sine wave.

**OR**

b) Write the expressions for Poly phase emfs and represent them by phasor diagram.

11. a) Derive the expression for current in RL parallel circuit using Vector method.

**OR**

b) Derive the expression for impedance and current of single phase parallel RLC circuit.

12. a) Calculate the power in 3 phase balanced resistive circuit connected to 3 phase 440V, 50Hz carrying line current of 0.5A.

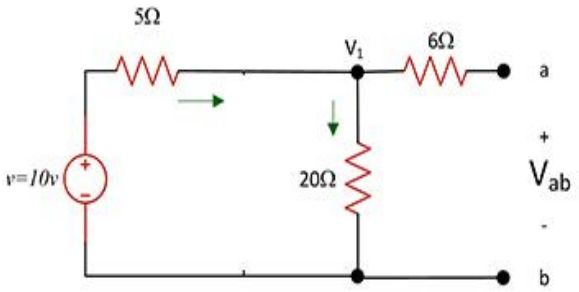
**OR**

b) Write the expression for power in balanced three phase star circuit and delta circuit.

## PART - C

**Instructions:** (1) Answer the following questions
(2) Each question carries **five** marks. **Marks: 4 X 5 = 20**

13. a) Find the Thevenins equivalent of the circuit shown below:




**OR**

b) Derive an expression for Current and Power factor in RC parallel circuit using Vector method.

14. a) A current of 10A flows through a non-inductive resistance in series with a coil when supplied at 250V, 50Hz. If the voltage across the resistance is 250V and across the coil is 400V, calculate a) impedance of the coil and b) total power consumed by the circuit.

**OR**

b) Explain how to generate the 3 phase emf's with neat figures.

15. a) A parallel RLC circuit with a 16 Ω resistance, 8 Ω inductive reactance, and 20 Ω capacitive reactance is supplied by a 120-V power supply. What are the values of currents through R, L and C, total line current and active power?

OR

b) A parallel RC circuit has a power supply of 100 V, 60 Hz. A current of 10A flows through the resistor and a current of 10A flows through the capacitor. Calculate the values of line current, true power, reactive power, apparent power and power factor?

16. a) Three identical impedances are connected in delta to a 3-phase 400 V, 50Hz supply. The line current is 34.65 A and the total power taken from the supply is 14.4 kW. Calculate the resistance and reactance values of each impedance.

**OR**

b) Three coils each having a resistance of 20Ω and inductive reactance of 15Ω are connected in star to a 3-phase, 400V, 50Hz supply. Calculate a) line current, and b) power consumed.

# EE-305 : ELECTRICAL POWER SYSTEMS-GENERATION

| Course Title: | **Electrical Power Systems - Generation** | Course Code | **EE-305** |
|---|---|---|---|
| Semester | **III Semester** | Course Group | **Core** |
| Teaching Scheme in Periods (L:T:P) | **60:15:0** | Credits | **2.5** |
| Methodology | **Lecture + Tutorials** | Total Contact Periods | **75** |
| CIE | **60 Marks** | SEE | **40 Marks** |

## Pre requisites

This course requires the knowledge of

(i) Basic principle and working of generators, transformers

(ii) Voltage and current calculations in the circuits using KCL, KVL

## Course Outcomes

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

| | |
|---|---|
| CO1 : | Classify various sources of Energy. |
| CO2 : | Explain the construction and working of Thermal power station |
| CO3 : | Explain the construction and working of Hydroelectric power stations. |
| CO4 : | Explain the construction and working of Nuclear Power station. |
| CO5 : | Importance of Solar and wind power generation |
| CO6 : | Outline the need for integrated Operation and economics of Power Generation |

## Blue Print of Marks for SEE

| **Unit No** | **Unit Name** | **Periods** | **Questions to be set for SEE** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **R** | | | **U** | **A** |
| 1 | Introduction to different sources of Energy | 10 | Q4 | Q1 | | Q9(a) | Q13(a) |
| 2 | Thermal Power Stations | 15 | | | | | |
| 3 | Hydro Electric Power Stations | 13 | | Q2 | | Q10(a) | Q14(a) |
| 4 | Nuclear Power Stations | 12 | | | | | |
| 5 | Solar and Wind Power Generation | 15 | | Q3 | Q5,Q6 | Q9(b), Q11(a), Q11(b) | Q13(b), Q15(a), Q15(b) |
| 6 | Integrated Operation and Economics of Power Generation | 10 | | | Q7,Q8 | Q10(b), Q12(a), Q12(b) | Q14(b), Q16(a), Q16(b) |
| **Total** | | **75** | **8** | | | **8** | **8** |

## Course Contents

### UNIT 1 - Introduction to different sources of energy

**Duration:10 Periods (L:8– T:2)**

Different sources of energy - Conventional and Non-conventional sources - Need for Non-Conventional Energy based power generation - Merits and Limitations of Conventional and Non-conventional sources - Methods of generation of energy from different sources of power such as Bio-mass, Geo-Thermal and Tidal - Need for energy conservation and their methods

### UNIT 2 - Thermal Power Station

**Duration:15 Periods (L:12– T:3)**

Thermal Power Station - Principle of working - Factors for selection of site - Block diagram of condensing type thermal power station - Thermal power station - Components and principles of working - pulverization, Condensation, Cooling towers and their types – advantages & limitations -Thermal power stations in telangana - Causes of pollution and methods to control them

### UNIT 3 - Hydro Electric Power stations

**Duration:13 Periods (L:11–T:2)**

Hydro Electric Power Station – requirements for setting up of hydroelectric power stations – principle of working - Hydrograph -Classification of hydroelectric power stations based on head, duty, location and hydraulic considerations - Working of High Head, Medium Head, Low Head Power Stations - need of surge tank, fore bay, spill gates – advantages & limitations - Hydro power stations in telangana.

### UNIT 4 - Nuclear power stations

**Duration:12 Periods (L:10– T:2)**

Nuclear energy, fission and fusion reactions –various nuclear fuels - Merits and limitations of nuclear power stations - Working of nuclear power station with a block diagram - Moderator in nuclear reactors - Need of coolant, reflector, control rods - Materials used for coolant, reflector, control rods – list the nuclear power stations in india.

### UNIT 5 - Solar and Wind Power Generation

**Duration:15 Periods (L:12– T:3)**

Solar radiation - Principle of Conversion of solar radiation into heat - solar collectors - types - working principle of flat plate collector, concentrating collectors - methods of storing solar energy - Principle of photo voltaic conversion - Working principle of solar cell - VI-Characteristics of Solar cell - concept of solar panel - types - Power available in wind - Site selection for installing Wind mill-basic components, constructional details and working principle of wind mill

**UNIT 6 - Integrated Operation and Economics of Power Generation**

**Duration:10 Periods (L:8– T:2)**

Isolated operation and integrated operation of power stations - merits and limitations – cost of electrical energy – classify the cost as fixed and running - Load curve, load factor, diversity factor and maximum demand - Effects of load factor and diversity factor in power generation - Solve simple problems - Consumer tariffs –types - Effect of power factor on the electricity charges and methods to improve it

## Reference Books


1. S.L.Uppal -Electrical Power
2. Soni, Guptha, Bhatnagar – Electrical Power Systems - Dhanpat Rai & Sons
3. A.T. Starr - Generation, Transmission and Utilisation
4. C.L.Wadhwa -Electrical Power Systems – New age international(P) limited
5. NEDC AP- Non Conventional Energy Guide Lines
6. JB Guptha – Electrical power plants
7. G.D. Roy Non conventional energy sources
8. CL Wadhwa - Electrical power Systems – New Age International(P) limited.
9. KR Padiyar -HVDC Power Transmission system Technology
10. S.N.Singh -Electrical Power generation, transmission and distribution.


## Suggested E-learning references

1. http://electrical4u.com/
2. www.nptel.ac.in
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/

## Suggested Learning Outcomes

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

**CO1 : Classify various sources of Energy**

1.1 List different sources of energy
1.2 Classify the sources of energy into conventional and non-conventional.
1.3 State the necessity of developing non-conventional methods of power generation.
1.4 State the relative merits of Conventional types of sources.
1.5 State the limitations of Conventional types of sources.
1.6 State the relative merits of Non-Conventional types of sources.
1.7 State the limitations of Non-Conventional types of sources.
1.8 Explain the method of generating electrical energy from Biomass Power
1.9 Explain the method of generating electrical energy from Geo-thermal Power
1.10 Explain the method of generating electrical energy from Tidal Power

1.11 State the need of energy conservation
1.12 List different methods of energy conservation

**CO2 : Explain the construction and working of thermal power station**

2.1 State the principle of working of thermal power stations.
2.2 List the requirements for setting up of Thermal Power Station.
2.3 Draw the detailed line diagram of a condensing type thermal power station.
2.4 Explain the working of each component of thermal power station.
2.5 Define Pulverization.
2.6 State the advantages of Pulverization
2.7 Define Condensation.
2.8 State the advantages of Condensation
2.9 State the necessity of cooling towers in thermal power plant
2.10 List the types of cooling towers used in thermal power plants.
2.11 State the advantages of thermal power plants
2.12 State the limitations of thermal power plants
2.13 List the thermal power stations in telangana with their location and their capacity.
2.14 State the causes of pollution in thermal power station.
2.15 List the methods to control Pollution in thermal power station.

**CO3 : Explain the construction and working of Hydroelectric power stations.**

3.1 List the requirements for setting up of Hydro Electric Power Station
3.2 Explain the principle of working of Hydro power station.
3.3 Define Hydrograph.
3.4 Classify the Hydro Electric Power stations based upon head.
3.5 Classify the Hydro Electric Power stations based upon duty
3.6 Classify the Hydro Electric Power stations based upon location
3.7 Classify the Hydro Electric Power stations based upon hydraulic considerations.
3.8 Explain the working of High Head Power Station with layout diagram.
3.9 Explain the working of Medium Head Power Station with layout diagram.
3.10 Explain the working of low Head Power Station with layout diagram.
3.11 State the need of Surge Tank.
3.12 State the need of Forebay.
3.13 State the need of Spill gates.
3.14 State the advantages of Hydro Electric Power stations
3.15 State the limitations of Hydro Electric Power stations
3.16 List the Hydro power stations in Telangana with their location and their capacity

**CO4 : Explain the construction and working of Nuclear Power station.**

4.1 State the importance of nuclear energy
4.2 Explain fission reactions.
4.3 Explain fusion reactions.
4.4 List various nuclear fuels used in nuclear power station
4.5 State the merits of Nuclear power stations.
4.6 State the limitations of Nuclear power stations.
4.7 Explain the working of Nuclear power station with a block diagram.
4.8 State the use of moderator in nuclear reactor.
4.9 State the need for coolant.
4.10 State the need for reflector.

4.11 State the need for control rods.
4.12 State the materials used for coolant.
4.13 State the materials used for Reflector.
4.14 State the materials used for control rods
4.15 List the Nuclear power stations in india.

**CO5 : Importance of Solar and wind power generation**

5.1 State the amount of solar radiation reaching the earth's surface.
5.2 State the principle of conversion of solar radiation into heat.
5.3 Define solar collector.
5.4 List the types of solar collectors.
5.5 Explain the working of flat plate collector.
5.6 Identify different types of concentrating collectors.
5.7 Explain the working of focusing type concentrating collector.
5.8 Explain the working of parabolic trough type concentrating collector.
5.9 State the different methods of storing solar energy.
5.10 State the principle of photo-voltaic conversion
5.11 Define solar cell
5.12 State the working principle of solar cell.
5.13 Describe the current voltage characteristics of solar cell.
5.14 State the function of solar panel.
5.15 List the different types of solar panels.
5.16 Explain the method of generating electrical energy from solar Power
5.17 Mention the power available in the wind and the force caused by it on the blades.
5.18 State the different considerations for site selection for installing wind mill.
5.19 List the basic components of a wind mill.
5.20 Describe the constructional details of the wind mill.
5.21 Explain the working principle of the wind mill

**CO6 : Outline the need for integrated Operation and economics of Power Generation**

6.1 State the need for integrated operation of power stations.
6.2 Differentiate between isolated operation and integrated operation of power stations.
6.3 List the merits of integrated operation.
6.4 State the limitations of integrated operation.
6.5 Classify the cost as fixed and running.
6.6 Define Load curve and Maximum demand
6.7 Define Load factor and Diversity factor
6.8 Discuss the effects of load factor on the cost of generation
6.9 Discuss the effects of diversity factor on the cost of generation
6.10 Simple problems on the above.
6.11 Define tariff.
6.12 State different types of consumer tariffs.
6.13 Explain simple tariff
6.14 Explain Flat rate tariff
6.15 Explain Block rate tariff
6.16 Explain two part tariff
6.17 Explain Maximum demand tariff
6.18 Explain Power factor tariff
6.19 Explain Three part tariff
6.20 Discuss the effects of power factor on electricity charges
6.21 Mention the methods to improve Power Factor.

## Suggested Student Activities

1 Student visits Library to refer to Electrical Manuals.
2 Student prepares the models of the power plants
3 Student visits Power generating stations familiarize with the equipment.
4 Visit Power nearby substations and gets familiar with the components.
5 Students may be asked to prepare model project of the power system.
6 Prepare charts on different Generating stations in our state mentioning their locations.
7 Gather information of HVDC transmission projects in India and prepare a report
8 Identify different insulators in your surroundings and prepare a report
9 Group discussion.
10 Surprise tests and Quiz.

## CO-PO Mapping Matrix

| | Basic and Discipline Specific knowledge | Problem Analysis | Design/Development of Solutions | Engineering Tools, Experimentation & Testing | Engineering practices for society, sustainability and environment | Project Management | Lifelong learning | Linked PO |
|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | |
| CO1 | 3 | 2 | | | 2 | | | PO 1, 2, 5 |
| CO2 | 2 | 1 | | | 3 | | | PO 1, 2, 5 |
| CO3 | 3 | 1 | | | 1 | | | PO 1, 2, 5 |
| CO4 | 3 | 1 | | | 3 | | | PO 1, 2, 5 |
| CO5 | 2 | 2 | | | 1 | | | PO 1, 2, 5 |
| CO6 | 2 | 3 | | | 2 | | | PO 1, 2, 5 |

**STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TELANGANA**
**DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.**

**SUB CODE: EE-305**
**ELECTRICAL POWER SYSTEMS – GENERATION**

**MID SEM -I EXAM MODEL PAPER**

**TIME: 60 MIN.** **TOTAL MARKS: 20**

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**PART – A** **Marks: 4 X 1= 4**

**Instructions:** (1) Answer all questions
(2) Each question carries **one** mark.

1. Define conventional energy.
2. State any two non conventional sources of energy.
3. Define Condensation.
4. State types of cooling towers

**PART - B** **Marks: 2 x 3 = 6**

**Instructions:** (1) Answer **all** questions.
(2) Each question carries **three** marks.

5.(a) State the need of energy conservation
OR
5.(b) State the relative merits of Conventional types of sources

6.(a) State the advantages of Pulverization
OR
6. (b) State the necessity of cooling towers

**PART - C** **Marks: 2 x 5= 10**

**Instructions:** (1) Answer **all** questions.
(2) Each question carries **five** marks.

7.(a). Explain the method of generating electrical energy from Biomass Power.

OR

7.(b). Explain the method of generating electrical energy from Geo-thermal Power

8.(a). Draw the simple line diagram of a condensing type thermal power station
OR
8.(b). Discuss the causes of pollution in thermal power station.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA**
**DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.**

**SUB CODE: EE-305**
**ELECTRICAL POWER SYSTEMS - GENERATION**

**MID SEM -II EXAM MODEL PAPER**

**TIME: 60 MIN.** **TOTAL MARKS: 20**

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**PART – A** **Marks: 4 X 1= 4**

**Instructions:** (1) Answer all questions
(2) Each question carries **one** mark.

1. Define Hydrograph.
2. Classify the Hydro Electric Power stations based upon duty
3. Define fission reactions.
4. State any nuclear fuels of energy.

**PART - B** **Marks: 2 x 3 = 6**

**Instructions:** (1) Answer all questions.
(2) Each question carries **three** marks.

5.(a). State the need of Surge Tank.
OR
5.(b). List the Hydro power stations in Telangana with their location and their capacity

6.(a). State the need for coolant in nuclear power station.
OR
6.(b). State the materials used for control rods

**PART - C** **Marks: 2 x 5 = 10**

**Instructions:** (1) Answer **all** questions.
(2) Each question carries **five** marks.

7.(a). Explain the working of High Head Power Station with layout diagram.
OR
7.(b). State the advantages and limitations of Hydro Electric Power stations

8.(a). Draw the block diagram of Nuclear power station.
OR
8.(b). State the necessity of moderator and reflector in nuclear power station.

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA**
**DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.**

**SUB CODE: EE-305**
**ELECTRICAL POWER SYSTEMS - GENERATION**

**SEMESTER END EXAM MODEL PAPER**

**TIME: 2 HOURS** **TOTAL MARKS: 40**

**PART – A** **Marks: 8 × 1= 8**

**Instructions:** (1) Answer all questions
(2) Each question carries **one** mark.

1. Define energy conservation.
2. Define fusion reactions.
3. Define solar collector.
4. State the need for control rods in nuclear power station.
5. List any two types of solar panels.
6. List any two types of concentrating collectors.
7. Define tariff.
8. Define Load curve.

**PART – B** **Marks: 4 × 3= 12**

**Instructions:** (1) Answer all questions.
(2) Each question carries **three** marks.

9.(a) Compare conventional and non conventional energy sources in any three aspects
OR
9.(b) State the principle of photo-voltaic conversion

10.(a) Explain the working of low Head Power Station with layout diagram.
OR
10.(b) Define Load factor and Diversity factor

11.(a) List the basic components of a wind mill.
OR
11.(b) Draw the VI characteristics of solar cell.

12.(a) Explain simple tariff
OR
12.(b) List any three merits of integrated operation.

## PART – C

**Marks: 4 × 5= 20**

**Instructions:** (1) Answer all questions.
(2) Each question carries **five** marks.

13.(a) Explain the method of generating electrical energy from Tidal Power.

OR

13. (b) Explain the working of parabolic trough type concentrating collector.

14. (a) Analyze the merits and limitations of Nuclear power stations.

OR

14.(b) Differentiate between isolated operation and integrated operation of power stations

15.(a) Explain the method of generating electrical energy from solar Power

OR

15.(b) Explain the working principle of the wind mill

16.(a) Discuss the effects of power factor on electricity charges

OR

16.(b) Explain Three part tariff

# EE-306 : ELECTRICAL & ELECTRONICS MEASURING INSTRUMENTS

| Course Title: | **Electrical and Electronic Measuring Instruments** | Course Code | **EE-306** |
|---|---|---|---|
| Semester | **III Semester** | Course Group | **Core** |
| Teaching Scheme in Periods (L:T:P) | **60:15:0** | Credits | **2.5** |
| Methodology | **Lecture + Tutorials** | Total Contact Periods | **75** |
| CIE | **60 Marks** | SEE | **40 Marks** |

## Pre requisites

This course requires the knowledge of basic electrical quantities, its units and basic mechanical quantities.

## Course Outcomes

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

| | |
|---|---|
| CO 1 | Define the terms of measuring instruments and classify the types. |
| CO 2 | Apply the MC, MI and Dynamometer measuring instruments. |
| CO 3 | Measure the Electrical power and energy |
| CO 4 | Measure Resistance, Inductance and Capacitance. |
| CO 5 | Analyze the basic principles of transducers and sensors |
| CO 6 | Compare Electronic and Digital instruments |

## Blue Print of Marks for SEE

| Unit No | Unit Name | Periods | Questions to be set for SEE | | | | |
|---|---|---|---|---|---|---|---|
| | | | R | | | U | A |
| 1 | Basics of Measuring Instruments | 10 | 4 | 1 | | 9(a) | 13(a) |
| 2 | Voltage and Current Measuring Instruments | 15 | | | | | |
| 3 | Power and Energy Measuring Instruments | 15 | | 2 | | 10(a) | 14(a) |
| 4 | Measurement of Basic Circuit Elements | 10 | | | | | |
| 5 | Transducers and Sensors | 12 | | 3 | 5,6 | 9(b), 11(a), 11(b) | 13(b), 15(a), 15(b) |
| 6 | Analog and Digital Electronic Instruments | 13 | | | 7,8 | 10(b), 12(a), 12(b) | 14(b), 16(a), 16(b) |
| | **Total** | **75** | **8** | | | **8** | **8** |

## Course Contents

### UNIT 1 - Basics of Measuring Instruments

**Duration: 10 Periods (L: 8- T: 2)**

Definitions of accuracy, precision, error, resolution and sensitivity - Electrical quantities and units - Measuring instruments used - Classification of instruments - Types of torques (deflection, controlling and damping torques) in indicating instruments- Types of errors.

### UNIT 2 – Voltage and Current Measuring Instruments

**Duration: 15 Periods (L: 12 – T:3)**

M.C. and M.I ammeters and voltmeters- construction and working – errors – remedies – comparison- Concept of shunts and multipliers for M.C instruments - Dynamometer type ammeter, voltmeter and wattmeter–construction, working, and errors.

### UNIT 3 – Power and Energy Measuring Instruments

**Duration: 15 Periods (L: 12 – T:3)**

Need for instrument transformers - measurement of power - single phase induction type energy meter - construction and working, error and adjustments – connections of a three phase energy meter - construction and working of Weston synchroscope.

### UNIT 4 – Measurement of Basic Circuit Elements

**Duration: 10Periods (L:8– T:2)**

Classification of resistance- methods of resistance measurement - basic Ohmmeter circuit - series and shunt ohmmeters - construction and working of megger– measurement of earth resistance using Megger – Potentiometer - construction, working principle and applications - measurement of inductance – measurement of capacitance.

### UNIT 5 – Transducers and Sensors

**Duration: 12 Periods (L:9 – T:3)**

Definition of transducer -classification of transducers - factors influencing selection of transducer - applications of transducers - thermocouple – thermister- strain gauge - LVDT - basic concept of sensors and its applications – Principle of semiconductor sensors.

**UNIT 6 – Analog and Digital Electronic Instruments**

**Duration:13 Periods (L:10 – T:3)**

Basic components of analog electronic instruments - Principle of working of rectifier type voltmeter and ammeter - basic components of digital electronic instruments - advantages of digital instruments over analog instruments- types of digital voltmeters - specifications of digital voltmeter - working of digital multimeter and its specifications - working of single phase digital energy meter with block diagram - use of tong tester - comparison between digital and electromechanical measuring instruments.

## Reference Books


1. A.K.Sawhney Electrical and Electronic measuring instruments –Dhanpat Rai & Sons.
2. E.W.Golding and F.C.Widdis – Electrical Measurements and measuring instruments–Wheeler publishers.
3. David A Bell, Electronic Instrumentation and Measurements–Oxford.
4. B.L.Theraja, Electrical Technology-S.Chand& Co.
5. Khandpur, Modern Electronic Equipment
6. J.B.Gupta, Electrical and Electronic measuring instruments.
7. Harris, Electrical measurements
8. K.B.Bhatia, Study of Electrical Appliances and Devices– Khanna Publishers


## Suggested E-learning references

1. http://electrical4u.com/
2. www.nptel.ac.in
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/
4. https://nptel.ac.in/courses/108105053/

## Suggested Learning Outcomes

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

**CO1: Define the terms of measuring instruments and classify the types.**

1.1 Define the terms accuracy, precision, error, resolution and sensitivity.

1.2 List electrical quantities to be measured their units.

1.3 List electrical measuring instruments to measure electrical quantities.

1.4 Classify the instruments on the basis of construction and output as analog and digital instruments.

1.5 Classify the electro mechanical instruments according to principle of working.

1.6 Classify the instruments on basis of method of measuring the value as absolute andsecondary instruments.

1.7 Distinguish between absolute and secondary instruments.

1.8 List the types of secondary instruments (indicating, integrating and recording) with examples.

1.9 Explain the purpose of obtaining deflecting torque in indicating instruments.

1.10 Illustrate the purpose of obtaining controlling torque in indicating instruments.

1.11 Explain the purpose of obtaining damping torque in indicating instruments.

1.12 List the methods of obtaining deflecting torque in indicating instruments.

1.13 Explain the methods of obtaining deflecting torque in indicating instruments.

1.14 List the methods of obtaining controlling torque in indicating instruments.

1.15 Elaborate the methods of obtaining controlling torque in indicating instruments.

1.16 List the methods of obtaining damping torque in indicating instruments.

1.17 Illustrate the methods of obtaining damping torque in indicating instruments.

1.18 Classify the errors according to its source (gross, systematic and random).

**CO2: Apply the MC, MI and Dynamometer measuring instruments.**

2.1 Explain the working of permanent magnet moving coil instrument (voltmeter/ammeter).

2.2 List the types of errors commonly occurring in moving coil (M.C.) instruments.

2.3 Illustrate the remedies for the commonly occurring errors in M.C instruments.

2.4 Outline the advantages and disadvantages of M.C instruments.

2.5 List the applications of M.C instruments.

2.6 Illustrate the working of moving iron (M.I) Attraction type Instrument with a legible sketch.

2.7 Explain the construction and working of moving iron (M.I) Repulsion type Instrument with a legible sketch.

2.8 List the errors commonly occurring in M.I. Instruments.

2.9 Outline the advantages and disadvantages of M.I. instruments.

2.10 Compare M.C. and M.I instruments.

2.11 Extend the range of moving coil ammeter using Shunt with a legible sketch.

2.12 Solve simple problems on extension of the range of MC ammeter using the shunt.

2.13 Extend the range of moving coil voltmeter using multiplier with a legible sketch.

2.14 Solve simple problems on extension of the range of MC voltmeter using multiplier.

2.15 Explain the construction of dynamometer type instruments with a neat diagram.

2.16 Illustrate the working of dynamometer type instruments.

2.17 List the common errors in the dynamometer instruments.

2.18 List the advantages of dynamometer instruments.

2.19 List the disadvantages of dynamometer instruments

**CO3: Measure the Electrical power and energy**

3.1 Discuss the need for instrument transformers (current transformer and potential transformer).

3.2 List the applications of instrument transformers

3.3 State the precaution to be taken before using current transformer.

3.4 Develop the circuit diagram for measuring power with wattmeter in single phase circuit in with instrument transformers.

3.5 Develop the circuit diagram for measuring power and power and power factor in 3 phase circuit using one wattmeter.

3.6 Develop the circuit diagram for measuring power and power and power factor in 3 phase circuit using two wattmeters.

3.7 Develop the circuit diagram for measuring power and power and power factor in 3 phase circuit using three wattmeters.

3.8 Explain the construction and working of a single phase induction type energy meter.

3.9 Define meter constant.

3.10 List the common errors and their remedies in single phase energy meter.

3.11 Outline the connections of a three phase energy meter.

3.12 Explain the construction and working of Weston synchroscope.

**CO 4: Measure Resistance, Inductance and Capacitance.**

4.1 Classify the resistances based on its value.

4.2 List the methods of measurements of low resistances.

4.3 List the methods of measurements of medium resistances.

4.4 List the methods of measurements of high resistances.

4.5 Show the circuit diagram of basic ohm meter.

4.6 Explain the working of basic ohmmeter.

4.7 Draw the circuit diagram of series type ohmmeter.

4.8 Develop the circuit diagram of shunt type ohmmeter.

4.9 Explain the construction and working of Megger.

4.10 Illustrate the method of measurement of earth resistance using earth megger with a legible sketch.

4.11 Describe the construction of basic potentiometer with a legible sketch.

4.12 Explain the working of basic potentiometer with a legible sketch.

4.13 Explain the measurement of unknown resistance using potentiometer.

4.14 List the applications of potentiometer.

4.15 List various bridges used to measure inductance.

4.16 List various bridges used to measure capacitance.

**CO5: Analyze the basic principles of transducers and sensors.**

5.1 Define transducer.

5.2 State the need of transducers in measurement systems.

5.3 Classify T ransducers.

5.4 List the applications of transducers.

5.5 Utilize Thermocouple for the measurement of temperature.

5.6 Make use of thermister for the measurement of temperature and in a bridge circuit.

5.7 Explain the working principle of strain gauge.

5.8 Describe the construction of Linear Variable Differential Transformer (LVDT).

5.9 Elaborate the working of LVDT.

5.10 Explain the concept of sensor.

5.11 List the applications of sensors.

5.12 List semiconductor sensors.

**CO6: Compare Electronic and Digital instruments.**

6.1 List the basic components of analog electronic instruments.

6.2 List various analog electronic instruments.

6.3 Discuss the working principle of rectifier type voltmeter with a neat diagram.

6.4 Discuss the working principle of rectifier type ammeter with a legible sketch.

6.5 List the basic components of digital electronic instruments.

6.6 Compare digital instruments and analog instruments.

6.7 List the types of digital voltmeters.

6.8 Mention the specifications of digital voltmeter.

6.9 Explain the working of digital multimeter with block diagram by giving its specifications.

6.10 Explain the working of single phase digital energy meter with block diagram.

6.11 State the uses of tong tester (clamp meter).

## Suggested Student Activities

1. Prepare a report on the methods adopted for calibration of digital energy meters in TSSPDCL/TSNPDCL.
2. Prepare a report on various meters used in nearby industries or substations.
3. Visit any nearby factory / industry and prepare a report on applications of various transducers in that industry clearly mentioning the purpose.
4. Using megger, determine the earth resistance of the earth pit at your college and prescribe suitable measures to maintain the earth resistance at optimum value
5. Prepare posters indicating usage of suitable meters/ instruments with circuits to measure current, voltage, power and energy in DC and AC (Single phase) circuits
6. Mini project on measurement methods of Resistance, Inductance and Capacitance
7. Student visits lab to identify the available electrical measuring instruments
8. Visit MRT division Electricity Department to understand the testing and repair of various measuring instruments. Write a report on observations.
9. Visit any Electrical / Electronic Measuring Instrument manufacturing industry to observe and understand the construction and working of various meters. Write a Report on observation.
10. Quiz
11. Group discussion
12. Surprise test
13. Assignment
14. Seminar

## CO-PO Mapping Matrix

| | Basic and Discipline Specific knowledge | Problem Analysis | Design/Development of Solutions | Engineering Tools, Experimentation & Testing | Engineering practices for society, sustainability and environment | Project Management | Lifelong learning | Linked PO |
|---|---|---|---|---|---|---|---|---|
| CO\PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO6 | PO7 | |
| CO1 | 3 | - | - | 1 | - | - | - | 1,4 |
| CO2 | 3 | 2 | - | 2 | - | - | - | 1,2,4 |
| CO3 | 3 | 1 | - | 2 | - | - | - | 1,2,4 |
| CO4 | 3 | 1 | - | 1 | - | - | - | 1,2,4 |
| CO5 | 3 | 1 | | 1 | - | - | 1 | 1,2,4,7 |
| CO6 | 3 | - | | 1 | - | - | - | 1,4 |

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING,TELANGANA**

**MODEL QUESTION PAPER**

**DEEE III SEMESTER MID SEMESTER-I EXAMINATION**

**Corse Code: EE-306** **Duration:1**Hour

**Course Name: Electrical and Electronic Measuring Instruments**

**Max.Marks:20**

## PART-A

**Instructions:** Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

1. Define accuracy related to measuring instruments.
2. List any four electrical quantities and their units.
3. List any two types of errors in moving coil instruments.
4. List any two advantages of dynamometer instruments.

## PART-B

Answer **two** questions. Each question carries three marks **2x 3 = 6 Marks**

5. a) Classify and define the errors according to its source.

**OR**

b) Classify the Electromechanical instruments based on working principle.

6. a) List the applications of moving coil instruments.

**OR**

b) Compare moving coil and moving iron instruments in any three aspects

## PART-C

**Instructions:** Answer **two** questions. Each question carries five marks **2x 5 = 10 Marks**

7. a) What are the different torqueses in indicating instruments? Explain the purpose of each.

**OR**

b) Distinguish between absolute and secondary instruments.

8. a) Explain the working of permanent magnet moving coil instrument.

**OR**

b) Explain the method of extending the range of moving coil ammeter with the help of shunt..

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING,TELANGANA**

**MODEL QUESTION PAPER**

**DEEE III SEMESTER MID SEMESTER-II EXAMINATION**

**Corse Code:EE-306** **Duration:1**Hour

**Course Name: Electrical and Electronic Measuring Instruments**

**Max.Marks:20**

## PART-A

**Instructions:** Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

1) List the applications of current transformer
2) What is the need for instrument transformers
3) List the applications of potentiometer
4) List any two bridges used to measure capacitance

## PART-B

**Instructions:** Answer **two** questions. Each question carries three marks **2x 3 = 6Marks**

5) a) Mention the precaution to be taken before using CT.

**OR**

b) Classify the common errors in 1phase energy meter.

6) a) Draw the circuit diagram of basic ohmmeter.

**OR**

b) Write the various methods of measuring high resistance.

## PART-C

**Instructions:** Answer **two** questions. Each question carries five marks **2x 5 = 10 Marks**

7) a) Explain how synchronization of alternator is done using Weston synchroscope.

**OR**

b) Draw the circuit diagram for measuring power with wattmeter in single– phase circuit in conjunction with instrument transformers.

8) a) Explain the measurement of unknown resistance with potentiometer with a legible sketch.

**OR**

b) Distinguish between shunt and series ohmmeters in any five aspects.

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**

**MODEL QUESTION PAPER**

**DEEE III SEMESTER**

**SEMESTER END EXAMINATION**

**Corse Code: EE-306** **Duration:2 hours**

**Course Name: Electrical and Electronic Measuring Instruments**

**Max.Marks:40Marks**

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## PART-A

Answer **all** questions 8**x1 =8 Marks**

1) Define resolution of a measuring instrument.
2) State the need for instrument transformers.
3) Define transducer.
4) List various bridges used to measure inductance.
5) List the applications of sensors.
6) Classify transducers based on the principle of transduction.
7) State the uses of tong tester.
8) List the types of digital voltmeters.

## PART-B

Answer **four** questions **4 x 3 = 12 Marks**

9) a) C l a s s i f y the types of secondary instruments.

**OR**

b) L i s t the applications of transducers.

10 a) L i s t the precautions while using current transformer.

**OR**

b) List the advantages of digital instruments over analog instruments.

11. a) State the disadvantages of Linear Variable Differential Transformer.

**OR**

b) State the working principle of strain gauge.

12. a) List the basic components of analog electronic instruments.

**OR**

b) Mention the specifications of digital voltmeter.

## PART-C

Answer **four** questions 4 **x 5 = 20 Marks**

13. a) Describe the method of extending the range of moving coil volt meter with thehelp of multiplier.

**OR**

b) Explain the application of thermocouple for the measurement of temperature.

14. a) Explain the working of basic ohmmeter.

**OR**

b) Explain the working of rectifier type voltmeter.

15. a) Describe the working of Linear Variable Differential Transformer.

**OR**

**b)** Explain the factors influencing the choice of transducer.

16. a) Explain the working of digital multimeter with block diagram.

**OR**

b) Explain the working of single phase digital energy meter with block diagram.

# EC-307 : DIGITAL ELECTRONICS LAB

| | | | |
|---|---|---|---|
| Course Title | Digital Electronics Lab | Course Code | EC-307 |
| Semester | III | Course Group | Practical |
| Teaching Scheme in Periods(L:T:P) | 1:0:2 | Credits | 1.25 |
| Methodology | Lecture+ Practical | Total Contact Periods | 45 |
| CIE | 60 Marks | SEE | 40 Marks |

## PRE REQUISITES

This course requires the basic skills of Handling bread boards and PCB.

## COURSE OUTCOMES

On successful completion of the course, the students will be able to attain below Course Outcome

| | |
|---|---|
| CO1 | Familiarize with logic gates and Boolean functions |
| CO2 | Realization of combinational logic circuits |
| CO3 | Realization of sequential logic circuits |

## Course Content and Blue Print of Marks for SEE

**CO1: Familiarize with logic gates and Boolean functions**

1) Identify Digital ICs of logic gates and note down pin details from data sheets

2) Verify the truth tables of Logic gates (AND, OR, NOT, NAND, NOR, EX- OR, EX –NOR)

3) Implement AND, OR, NOT gates using NAND, NOR gates and verify the Truth Tables.

4) Verify the truth table of XOR gate using NAND and NOR gates.

5) Implement and verify the truth table of a given Boolean function using basic and universal logic gates

**CO2: Realization of combinational logic circuits**

6)Verify the truth table of halfadder using basic and universal logic gates

7) Verify the truth table of fulladder implemented with 2 half adders.

8) Verify the truth tables of 4 X 1 MUX and 1 X 4 DE-MUX.

9) Verify the function of 8 X 3 Encoder with truth table

10) Verify the function of 3 X8 Decoder with truth tables.

11) Verify the functionof BCDto Decimal Decoder and write the truth tables.

**CO3 : Realization of sequential logic circuits**

12) Construct clocked SR FF using NAND gates and verify its truth table.

13) Verify the functionality and truth table of SR, JK, D, T flip flops.

14) Construct and verify the working of decade counter with truth table

15) Verify the working of Ring Counter with truth table

16) Construct and verify the working of synchronous up/down counter truth table

17) Verify the working of shift register with truth table

# EE-308 : DC MACHINES LAB

| | | | |
|---|---|---|---|
| Course Title: | **DC Machines Lab** | Course Code | **EE-308** |
| Semester | **III Semester** | Course Group | **Practical** |
| Teaching Scheme in Periods (L:T:P) | **15:0:30** | Credits | **1.25** |
| Methodology | **Lecture + Practical** | Total Contact Periods | **45** |
| CIE | **60 Marks** | SEE | **40 Marks** |

## Pre requisites

This course requires the skills of handling electrical tools, accessories and performing wiring connections

## Course Outcomes

Upon the completion of the course the students will have the ability to:

| **Course Outcomes** | |
|---|---|
| CO1 | Identify the terminals of DC Motors/Generators |
| CO2 | Draw and interpret the performance characteristics of DC Generators by conducting suitable Tests. |
| CO3 | List the parts of Starters and Evaluate the performance characteristics of DC Motors by Conducting suitable experiments. |
| CO4 | Apply various speed control methods on DC motors |

## Suggested Learning Outcomes

**CO-1Identify the terminals of DC Motors/DC Generators**

1.1 Identify the terminals of DC Shunt Motor/Generator
1.2 Identify the terminals of DC Series Motor/Generator
1.3 Identify the terminals of DC Compound Motor/Generator

**C0-2 Draw and interpret the performance characteristics of DC Generators by Conducting suitable experiments.**

2.1 Obtain OCC of a DC shunt Generator at rated speeds
2.2 Obtain Internal and External characteristics of DC Shunt Generator
2.3 Obtain Internal and External characteristics of DC Series Generator.
**2.4** Obtain Internal and External characteristics of DC Compound Generator

**CO-3List the parts of Starters and Evaluate the performance characteristics of DC Motors by conducting suitable Tests**.

3.1 Identify the parts of DC 3 point starter
3.2 Identify the parts of DC 4 point starter
3.3 Obtain performance characteristics by conducting Brake Test on DC Shunt Motor
3.4 Obtain performance characteristics by conducting Brake Test on DC Series Motor.
3.5 Obtain performance characteristics by conducting Brake Test on DC Compound Motor.
3.6 Obtain performance of DC Shunt Motor by conducting Swinburne's Test.

**CO-4 Apply various speed control methods on DC motors**

4.1 Speed control of DC Shunt Motor by Armature control method
4.2 Speed control of DC Shunt Motor by Field control method

## CO-PO Mapping Matrix

| | Basic and Discipline specific knowledge | Problem Analysis | Design/Development of solutions | ring Tools, Experimentation and Testing | or society sustainability and environment | Project Management | Life-long learning | Linked PO |
|---|---|---|---|---|---|---|---|---|
| CO\PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | |
| CO1 | 3 | 1 | | 3 | | 2 | | PO1,2,4,6 |
| CO2 | 3 | 1 | | 3 | | 2 | | PO1,2,4,6 |
| CO3 | 3 | 1 | | 3 | | 2 | | PO1,2,4,6 |
| CO4 | 3 | 1 | | 3 | | 2 | | PO1,2,4,6 |

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**
**MODEL QUESTION PAPER**
**DEEE IV SEMESTER**
**MID SEMESTER-I EXAMINATION**

**Course Code: EE-308** **Duration: 1 Hour**
**Course Name: DC Machines Lab** **Max. Marks: 20**

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**Note:** ***Answer allotted Question.***

***Instructions to the Candidate:***

***(i)Record the results on a graph sheet if required, and conclude your observation of the experiment***

***(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question***

1. Identify the terminals of DC Shunt motor
2. Identify the terminals of DC Series motor
3. Identify the terminals of DC Compound motor
4. Obtain OCC of a DC shunt Generator at rated speeds
5. Obtain Internal and External characteristics of DC Shunt Generator
6. Obtain Internal and External characteristics of DC Series Generator.
7. Obtain Internal and External characteristics of DC Compound Generator

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**

**MODEL QUESTION PAPER**

**DEEE IV SEMESTER**

**MID SEMESTER-II EXAMINATION**

**Course Code: EE-308** **Duration: 1 Hour**

**Course Name: DC Machines Lab** **Max.Marks: 20**

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**Note:** ***Answer allotted Question.***

***Instructions to the Candidate:***

***(i)Record the results on a graph sheet if required, and conclude your observation of the experiment***

***(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question***

1. Identify the parts of a 3 point starter
2. Identify the parts of a 4 point starter
3. Obtain performance characteristics by conducting Brake Test on DC Shunt Motor
4. Obtain performance characteristics by conducting Brake Test on DC Series Motor
5. Obtain performance characteristics by conducting Brake Test on DC Compound Motor.

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**
**MODEL QUESTION PAPER**
**DEEE IV SEMESTER**
**SEMESTER END EXAMINATION**

**Course Code: EE-308** **Duration: 2 Hour**
**Course Name: DC Machines Lab** **Max.Marks: 40**

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**Note:** ***Answer allotted Question.***

***Instructions to the Candidate:***

***(i)Record the results on a graph sheet if required, and conclude your observation of the experiment***

***(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question***

1. Identify the terminals of DC Shunt motor
2. Identify the terminals of DC Series motor
3. Identify the terminals of DC Compound motor
4. Obtain OCC of a DC shunt Generator at rated speeds
5. Obtain Internal and External characteristics of DC Shunt Generator
6. Obtain Internal and External characteristics of DC Series Generator.
7. Obtain Internal and External characteristics of DC Compound Generator
8. Identify the parts of a 3 point starter
9. Identify the parts of a 4 point starter
10. Obtain performance characteristics by conducting Brake Test on DC Shunt Motor
11. Obtain performance characteristics by conducting Brake Test on DC Series Motor.
12. Obtain performance characteristics by conducting Brake Test on DC Compound Motor.
13. Obtain performance of DC Shunt Motor by conducting Swinburne's Test.
14. Speed control of DC Shunt Motor by Armature control method
15. Speed control of DC Shunt Motor by Field control method

# EE-309 : CIRCUITS & MEASUREMENTS LAB

| Course Title: | **Circuits and Measurements Lab** | Course Code | **EE-309** |
|---|---|---|---|
| Semester | **III Semester** | Course Group | **Practical** |
| Teaching Scheme in Periods (L:T:P) | **15:0:30** | Credits | **1.25** |
| Methodology | **Lecture + Practical** | Total Contact Periods | **45** |
| CIE | **60 Marks** | SEE | **40 Marks** |

## Pre requisites

This course requires

- Data handling through graphs:
  - Select proper X & Y parameters
  - Choose proper scale
  - Analyse the trend of the graph
  - Correlate trend of the graph with the relation between the parameters
- Use of Voltmeter, Ammeter, Wattmeter & CRO
- The knowledge of electrical circuits and fundamentals of various measuring instruments

## Course Outcomes

Upon the completion of the course the students will have the ability to

| **Course Outcomes** | |
|---|---|
| CO1 | Apply Kirchhoff's laws and Network theorems to solve electric circuits |
| CO2 | Illustrate the method for range extension in D.C meters and relationships in Single phase R and R-L loads |
| CO3 | Compare calibrated meter readings with standard meters and Measure Power |
| CO4 | Experiment various methods to measure unknown resistance |

## Suggested Learning Outcomes

**1.0 Apply Kirchhoff's laws and Network theorems to solve Circuits**

1.1 Verify Kirchhoff's laws (KCL & KVL) in a DC circuit

1.2 Verify Thevenin's theorem in a DC circuit

1.3 Verify Maximum power transfer theorem in a DC circuit

1.4 Verify Super position theorem in a DC circuit with two sources

**2.0 Illustrate the methods of range extension in D.C. meters and Verify the voltage, current phasor relationship in 1-Φ AC circuits with R and R-L loads**

2.1 Extend the range of D.C. ammeter by using shunt resistances (low range to high range)

2.2 Extend the range of D.C. voltmeter by using series multiplier(low range to high range)

2.3 Verify that the voltage and current in 1-Φ AC circuit are in phase using CRO and draw the phasor diagram.

2.4 Verify that the current in 1-Φ AC circuit with pure RL - load lags the voltage using CRO and draw the phasor diagram.

**3 Compare calibrated meter readings with standard metersand Measure Power**

3.1 Calibration and testing of single phase energy meter

3.2 Calibration of dynamometer wattmeter

3.3 Measurement of Power in a three-phase balanced circuit with two watt meter method

**4 Experiment various methods to measure unknown resistance**

4.1 Measurement of Low and Medium resistance by Volt – ampere method

4.2 Measurement of resistance by Kelvin's double Bridge.

4.3 Measurement of earth resistance using digital earth tester

**CO-PO Mapping Matrix**

| | Basic and Discipline Specific know | Problem Analysis | Design/Development of Solutions | Engineering Tools, Experimentation & Testing | Engineering practices for society, sustainability and environment | Project Management | Lifelong learning | Linked PO |
|---|---|---|---|---|---|---|---|---|
| CO\PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO6 | PO7 | |
| CO1 | 3 | 1 | 1 | 2 | - | 2 | 1 | 1,2,3,4.6,7 |
| CO2 | 3 | - | 2 | 2 | - | 2 | 1 | 1,3,4,6,7 |
| CO3 | - | 1 | 3 | 2 | - | 2 | 1 | 2,3,4,6,7 |
| CO4 | - | 1 | 2 | 2 | - | 2 | 1 | 2,3,4,6,7 |

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**
**MODEL QUESTION PAPER**
**DEEE III SEMESTER**
**MID SEMESTER-I EXAMINATION**

**Corse Code: EE-309** **Duration: 1 Hour**
**Course Name: Circuits and Measurements Lab** **MaxMarks: 20**

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**Note:** ***Answer allotted Question.***

***Instructions to the Candidate:***

***(i)Record the results on a graph sheet if required, and conclude your observation of the experiment***

***(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question***

1. Verify Kirchhoff's current law in a DC circuit
2. Verify Kirchhoff's voltage law in a DC circuit
3. Verify Thevenin's theorem in a DC circuit
4. Verify Maximum power transfer theorem in a DC circuit
5. Verify Super position theorem in a DC circuit with two sources

**STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA**
**MODEL QUESTION PAPER**
**DEEE III SEMESTER**
**MID SEMESTER-II EXAMINATION**

**Corse Code: EE-309** **Duration: 1 Hour**
**Course Name: Circuits and Measurements Lab** **MaxMarks: 20**

---

**Note:** ***Answer allotted Question.***

***Instructions to the Candidate:***

***(i)Record the results on a graph sheet if required, and conclude your observation of the experiment***

***(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question***

1. Extend the range of D.C. ammeter by using shunt resistances (low range to high range)
2. Extend the range of D.C. voltmeter by using series multiplier(low range to high range)
3. Verify that the voltage and current in 1-Φ AC circuit are in phase using CRO and draw the phasor diagram.
4. Verify that the current in 1-Φ AC circuit with pure RL - load lags the voltage using CRO and draw the phasor diagram.

**State Board of Technical Education and Training, Telangana**
**Model Question paper**
**DEEE III Semester**
**Semester End Examination**

**Corse Code: EE-309** **Duration: 2 Hour**
**Course Name: Circuits and Measurements Lab** **MaxMarks: 40**

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**Note:** ***Answer allotted Question.***

***Instructions to the Candidate:***

***(i)Record the results on a graph sheet if required, and conclude your observation of the experiment***

***(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question***

1. Verify Kirchhoff's current law in a DC circuit
2. Verify Kirchhoff's voltage law in a DC circuit
3. Verify Thevenin's theorem in a DC circuit
4. Verify Maximum power transfer theorem in a DC circuit
5. Verify Super position theorem in a DC circuit with two sources
6. Extend the range of D.C. ammeter by using shunt resistances (low range to high range)
7. Extend the range of D.C. voltmeter by using series multiplier(low range to high range)
8. Verify that the voltage and current for 1-Φ AC circuit with pure R- load are in-phase using CRO and draw the phasor diagram.
9. Verify that the current in 1-Φ AC circuit with pure RL - load lags the voltage using CRO and draw the phasor diagram.
10. Calibration and testing of single-phase energy meter
11. Calibration of dynamometer wattmeter
12. Measurement of Power in a three-phase balanced circuit with two-watt meter method
13. Measurement of low and medium resistance by Volt Ampere method
14. Measurement of resistance by Kelvin's double Bridge.
15. Measurement of earth resistance using digital earth tester

# HU – 310-COMMUNICATION SKILLS & LIFE SKILLS LAB

| | | | |
|---|---|---|---|
| Course Title | Communication Skills & Life Skills Lab | Course Code | HU-310 |
| Semester | III | Course Group | Practical |
| Teaching Scheme in Periods-L:T:P | 1 : 0 : 2 | Credits | 1.25 |
| Methodology | Lecture + Practical | Total Contact Hours | 45 Periods (3 Periods per Week) |
| CIE | 60 Marks | SEE | 40 Marks |

Rationale:

The course is designed to impart listening skills and life skills to the students of diploma which will help them a great deal in personal and professional fronts.

Prerequisites:

The course requires the basic knowledge of vocabulary, grammar and four language learning skills, viz. Listening, Speaking, Reading and Writing.

**Course Contents**

1. **Listening Skills - I** **Duration:6(L2P4)**

    - A paragraph
    - A song
    - A recipe
    - A dialogue

2. **Life Skills- I** **Duration:9(L3P6)**

    1. Attitude
        - Features of attitude
        - Attitude and behaviour
        - Attitude formation
        - Positive attitude
        - Negativeattitude
        - Overcoming negative attitude
        - Attitude at work place

    2. Adaptability
        - Need for adaptability
        - Willingness to experiment
        - Fear of failure

- Think ahead
- Stay positive
- Curiosity
- Being in present

3. **Listening Skills- II** **Duration:6(L2P4)**
   - Biography
   - Interview
   - A Report
   - Telephone Conversation

4. **Life Skills-II** **Duration:9(L3P6)**

3. Goal setting
   - Importance of setting goals
   - What is goal setting
   - Short term goals
   - Long term goals
   - Achieve goals using SMART

4. Creativity
   - Flexibility
   - Curiosity
   - Determination
   - Innovative ideas

5. **Life Skills – III** **Duration:6(L2P4)**

5. Time Management
   - Features of time
   - Secrets of time management
   - Time wasters
   - Prioritization
   - Productive time
   - Time Quadrant

6. Human Values
   - Honesty and integrity
   - Work Ethics
   - Ego and Respect
   - Trust and Truthfulness
   - Social Responsibility
   - Character formation
   - Designing Destiny

6. **Life Skills- IV** **Duration:9(L3P6)**

7. Problem Solving and Decision Making
    - Define the problem
    - Generate Options
    - Evaluate and choose an option
    - Implement solution
    - Monitoring and Seeking Feedback

8. Leadership Qualities and Team Work
    - Significance of Leadership
    - Factors of leadership
    - Leadership styles
    - Leadership Skills
    - Importance of Team work
    - Characteristics of a good team
    - Benefits of team work
    - Problems of team work
    - Qualities of team player

**Course Outcomes**

| | |
|---|---|
| **CO** | A the end of the course the students will have the ability to: |
| **CO 1** | Comprehend factual information and infer the required details after listening to auditory input and respond to the given context. |
| **CO 2** | Comprehend factual information and infer the required details after listening to auditory input and respond to the given context. |
| **CO 3** | Develop positive attitude to adapt oneself to all the situations to succeed in professional and personal life. |
| **CO 4** | Set goals using SMART features for life and get inspired to get success in professional and personal life. Create innovative things and think out of the box. |
| **CO 5** | Apply various time management techniques and prioritize tasks effectively, and learn to be creative and innovative in thinking and maintain core human values in personal life and professional life. |
| **CO 6** | Develop problem-solving skills, make timely decisions, develop trust, confidence, leadership skills and team qualities. |

**CO-POMatrix**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | Mapping POs |
|---|---|---|---|---|---|---|---|---|
| **CO 1** | - | - | - | - | 3 | 2 | 3 | 5,6 and 7 |
| **CO 2** | - | - | - | - | 3 | 2 | 3 | 5,6 and 7 |
| **CO 3** | - | - | - | - | 3 | 3 | 3 | 5,6 and 7 |
| **CO 4** | | - | | - | 2 | 2 | 3 | 5,6 and 7 |
| **CO 5** | | | | | 2 | 2 | 3 | 5,6 and 7 |
| **CO 6** | | | | | 2 | 2 | 3 | 5,6 and 7 |

**Evaluation Pattern:**

**I. Continuous Internal Examination: 60 Marks**

a. Mid Sem- I 20 marks

Syllabus:

i. Listening Skills-I

ii. Life Skills-I

b. Mid Sem—II 20 marks

Syllabus:

i. Listening Skills-II

ii. Life Skills-II

**c. Internal assessment:** 20 marks

i. Seminars: 10 marks

ii.Assignments: 5 marks

iii. ab record submission: 5 marks

II. **Semester End Examination:** **40 Marks**

a. Listening:

10 Marks

b. Life Skills topics: 15 Marks

*b.* VivaVoce 15 Marks

a.


b. References:

c. Flint, Chris and Jamie Flockhart Is ending: A2 (CollinsEnglishforLife:Skills) Collins. 2013

d. Brown, StephenE.English inEverydayLife.McGraw-HillEducation.2008

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f. Susan Earle—Carlin.Q Skills for Success: Listening and Speaking5:Student Book with Online Practice. Oxford University Press. 2013

g. Kumar, Sanjay and Pushpa Latha. Communication Skills: A Work Book. Oxford University Press. 2018

h. Carnegie, Dale. The Leader in You. Simon & Schuster:1995

i. Carnegie, Dale. The Art of Public Speaking. Prabhat Prakashan. New DeIhi.2013

j. Kaye, Martin. Goal Setting (Work book Included) :Goals & Motivation: Introduction to A Complete & Proven Step – By – StepBlueprint For Reaching You Goals (GoalSetting Master Plan 1).Kindle Edition. MK Coaching.2016.

k. West, Steven. Critical Thinking Skills: Practical Strategies for Better Decision making,

l. Tracy, Brain. Goals. Berret – Koehler Publishers Inc.San Francisco.2017

m. Tracy, Brain. Master your Time Master your Life. Penguin Random House Inc. NewYork. 2017

n. Sean Covey. The 7 Habits of Highly Effective, Teens. Simon and Schuster, 2011


**E-Learning Resources:**

a. http://www.bbc.co.uk/wor1dservice/1eamingeng1ish/youmeus/1earnit/learnitv39.shtm1
b. https://www.exameng1ish.com/1eveltes/1istenin ge veltest.htm
c. https://www.oxfordon1ineenglish.com/1istening?utmreferrer=https%3A%2F%2Fwww.google.co.in%2F
d. https://takeie1ts.britishcounci1.org/prepare-test/free-ie1ts-practice-tests/listening-practice-test-1
e. https://learnenglish.britishcounci1.org/en/listening
f. https://www.cambridgeeng1ish.org/learning-english/activities-for-learners/?ski11=1istening
g. https://www.businesseng1ishsite.com/business-english-listening.html

**BOARD DIPLOMAEXAMINATION(C-24)**

**MID SEMESTER EXAMINATION-** I

**HU-310COMMUNICATION ANDLIFESKILLS**

**Time: One Hour** **Total Marks: 20**

**Part – A** **10 Marks**

1. Listening Comprehension (5 X 2 = 10)

***Instruction: Questions shall be given before reading the passage.***

Emperor Ashoka was an emperor in ancient India. He was also called Ashoka the Great. He lived a long time ago, around 304 BCE. When he was young, he became the king of a big part of India after a fight for power.

At first, Ashoka wanted to win more land and power. He fought many wars and won many battles. But one day, during a battle in a place called Kalinga, Ashoka saw a lot of people suffering and dying. This made him feel very sad and sorry for what he had done. He decided he didn't want to fight anymore.

After this, Ashoka became a follower of Buddhism, a peaceful religion. He started to teach people about being kind and not hurting others. He wrote down his ideas on big stone pillars and put them all over his kingdom. These were called the "Edicts of Ashoka."

Ashoka did many good things for his people. He built hospitals for sick people and shelters for travelers. He also helped spread Buddhism to other countries.

Ashoka's time as king was a peaceful and happy time for India. He is remembered as a great leader who wanted everyone to be happy and peaceful.

**Questions:**

a. Who was Ashoka?

b. Why did Ashoka stop fighting wars?

c. What religion did Ashoka follow after he stopped fighting?

d. What were the "Edicts of Ashoka"?

e. Name one good thing Ashoka did for his people.

**Part – B** **10 Marks**

2. How can maintaining a positive attitude in the face of challenges contribute to personal and professional growth?
3. Give an example of a situation where you had to adapt to unexpected changes or circumstances. How did your adaptability skills help you navigate through the situation effectively?

**BOARD DIPLOMAEXAMINATION(C-24)**

**MID SEMESTER EXAMINATION- II**

**HU-310COMMUNICATION ANDLIFESKILLS**

**Time: One Hour** **Total Marks: 20**

**Part – A** **10 Marks**

1. Listening Comprehension (5 X 2 = 10)

***Instruction: Questions shall be given before reading the passage***

Prithviraj Chauhan was a courageous emperor who ruled parts of northern India during the 12th century. He was born into the Chauhan dynasty, a family known for its valor and leadership. Prithviraj ascended to the throne at a young age after the death of his father, Someshwar Chauhan.

Prithviraj's reign was marked by numerous military conquests and battles to defend his kingdom against rival Rajput clans and foreign invaders. He was renowned for his exceptional skill in warfare, especially archery and horse riding. His bravery and strategic prowess earned him the admiration of his allies and the fear of his enemies.

One of the most famous events in Prithviraj's life was his legendary rivalry with the Afghan ruler, Muhammad Ghori. The two clashed in a series of battles for supremacy in northern India. The most notable of these battles was the Battle of Tarain, fought in 1191 CE. Despite being outnumbered, Prithviraj displayed remarkable leadership and tactical brilliance, leading his forces to victory and capturing Muhammad Ghori.However, the tide turned in the subsequent battle at Tarain in 1192 CE. Due to a betrayal by one of his allies and underestimating Ghori's tactics, Prithviraj faced defeat and was captured. He was taken as a prisoner to Ghori's capital, where he met his tragic end.

Prithviraj Chauhan's legacy remains etched in the annals of Indian history as a symbol of bravery, resilience, and honor. His valorous deeds continue to inspire generations, and his name is remembered with reverence as one of India's greatest warriors and emperors.

**Questions:**

1. Who was Prithviraj Chauhan?
2. What dynasty did Prithviraj Chauhan belong to?
3. What were Prithviraj Chauhan's notable skills in warfare?
4. Describe the rivalry between Prithviraj Chauhan and Muhammad Ghori.
5. What happened to Prithviraj Chauhan after the Battle of Tarain in 1192 CE?

**PART-B** **10Marks**

1. ***Instruction: Answer any one of the following questions in 150 words.***
2. Why is it important to set clear and achievable goals in both personal and professional life? give an example of a goal you have set for yourself and explain how you plan to achieve it.
3. How do you use a ‘pen’ in ten different ways apart from using it for writing?

**BOARDDIPLOMAEXAMINATION(C-24)**

**SEMESTER END EXAMINATION**

**HU-310 COMMUNICATION ANDLIFESKILLS**

**Time: Three Hours** **Total Marks: 40**

**Part – A** **10 Marks**

1. Listening Comprehension (5 X 2 = 10)

***Instruction: Questions shall be given before reading the passage***

Gautama Buddha, also known simply as the Buddha, was a spiritual leader who lived in ancient India around the 6th century BCE. Born into a noble family in Lumbini, now located in present-day Nepal, Siddhartha Gautama, as he was originally named, led a life of luxury and privilege.

However, Siddhartha's life took a profound turn when he encountered the realities of human suffering. Despite being sheltered from the harshness of the world, he witnessed old age, sickness, and death, which deeply troubled him. Determined to find answers to the mysteries of life and alleviate human suffering, Siddhartha renounced his princely status and embarked on a spiritual quest.

For years, Siddhartha wandered the forests of India, seeking enlightenment through meditation and ascetic practices. After undergoing rigorous self-discipline and introspection, he finally attained enlightenment under a Bodhi tree in Bodh Gaya, Bihar. It was during this transformative moment that Siddhartha became the Buddha, meaning the "Enlightened One."

Following his enlightenment, the Buddha dedicated his life to teaching others the path to liberation from suffering. He expounded the Four Noble Truths and the Eightfold Path, which form the core teachings of Buddhism. The Four Noble Truths explain the nature of suffering, its causes, its cessation, and the path to its cessation, while the Eightfold Path outlines the ethical and spiritual practices necessary to achieve liberation.

The Buddha's teachings emphasized compassion, mindfulness, and inner peace. He encouraged his followers to cultivate wisdom and lead a virtuous life guided by right understanding, intention, speech, action, livelihood, effort, mindfulness, and concentration.

Throughout his lifetime, the Buddha traveled extensively across northern India, preaching his message of enlightenment and compassion to people from all walks of life. His teachings transcended social barriers and cultural boundaries, attracting followers from diverse backgrounds.

Gautama Buddha's legacy endures as one of the most influential spiritual figures in human history. His teachings continue to guide millions of people around the world on the path to inner peace, compassion, and liberation from suffering.

**Comprehension Questions:**

1. Who was Gautama Buddha, and when did he live?
2. What prompted Siddhartha Gautama to leave his life of luxury?
3. Where did Gautama Buddha attain enlightenment?
4. What are the Four Noble Truths and the Eightfold Path?
5. How did Gautama Buddha's teachings impact society?

**PART-B** **15Marks**

***Instruction: Answer any one of the following questions in 150 words.***

2. Seminar on Life Skills Topics

**PART- C** **15Marks**

*3. Viva Voice*