

**UNIT I DC MACHINES**

9

Three phase circuits, a review. Construction of DC machines – Theory of operation of DC generators – Characteristics of DC generators- Operating principle of DC motors – Types of DC motors and their characteristics – Speed control of DC motors- Applications.

**UNIT II TRANSFORMER**

9

Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer-Transformer no-load phasor diagram — Transformer on-load phasor diagram – Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

**UNIT III INDUCTION MACHINES AND SYNCHRONOUS MACHINES**

9

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit – Construction of single-phase induction motors – Types of single phase induction motors – Double revolving field theory – starting methods - Principles of alternator – Construction details – Types – Equation of induced EMF – Voltage regulation. Methods of starting of synchronous motors – Torque equation – V curves – Synchronous motors.

**UNIT IV BASICS OF MEASUREMENT AND INSTRUMENTATION**

9

Static and Dynamic Characteristics of Measurement – Errors in Measurement - Classification of Transducers – Variable resistive – Strain gauge, thermistor RTD – transducer - Variable Capacitive Transducer – Capacitor Microphone - Piezo Electric Transducer – Variable Inductive transducer – LVDT, RVDT

**UNIT V ANALOG AND DIGITAL INSTRUMENTS**

9

DVM, DMM – Storage Oscilloscope. Comparison of Analog and Digital Modes of operation, Application of measurement system, Errors. Measurement of R, L and C, Wheatstone, Kelvin, Maxwell, Anderson, Schering and Wien bridges Measurement of Inductance, Capacitance, Effective resistance at high frequency, Q-Meter.

**TOTAL (L:45+T:15): 60 PERIODS****TEXT BOOKS:**

1. I.J Nagarath and Kothari DP, "Electrical Machines", McGraw-Hill Education (India) Pvt Ltd 4<sup>th</sup> Edition ,2010
2. A.K.Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co, 2004.

**REFERENCES:**

1. Del Toro, "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007.
2. W.D.Cooper & A.D.Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", 5<sup>th</sup> Edition, PHI, 2002.
3. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006.
4. Thereja .B.L, "Fundamentals of Electrical Engineering and Electronics", S Chand & Co Ltd, 2008.
5. H.S.Kalsi, "Electronic Instrumentation", Tata Mc Graw-Hill Education, 2004.
6. J.B.Gupta, "Measurements and Instrumentation", S K Kataria & Sons, Delhi, 2003.

## **SUBJECT DESCRIPTION AND OBJECTIVES**

### **AIM**

To expose the students to the concepts of three phase supply, various types of electrical machines , transmission and distribution of electrical power and basic concepts of measurement.

### **DESCRIPTION**

Electrical Engineering deals with the basics of electrical power generation, transmission and distribution of electrical power. It explains about the constructional detail, principle of operation, performance, testing of D.C. Machines, A.C. Machines and Special Machines. Also explain about the power System transmission and Distribution of Electrical Power.

The Instrumentation deals with the basic concepts of measurement to measure the R, L, C in electrical circuits and the various types of electronic measurements and the importance of digital instruments in measurements.

### **OBJECTIVES:**

- To introduce three phase supply and power measurement.
- To understand concepts in electrical generators, motors and transformers.
- To introduce power generation, transmission and distribution concepts.
- To learn basic measurement concepts.
- To learn the concepts of electronic measurements.
- To learn about importance of digital instruments in measurements

### **OUTCOMES:**

#### **Students will be able to understand**

- The three phase supply and power measurement.
- The concepts in electrical generators, motors and transformers.
- The basic measurement and instrumentation based devices.
- The relevance of digital instruments in measurements.

## MICRO LESSON PLAN

Week	Hours	LECTURE TOPICS	READING
<b>UNIT I DC MACHINES</b>			
I	1	Three phase circuits, a review	T1
	2	Three phase circuits, a review	T1
	3	Construction of DC machines (AV CLASS)	T1
	4	Theory of operation of DC generators	T1
	5	Characteristics of DC generators	T1
	6	Characteristics of DC generators	T1
II	7	Operating principle of DC motors (AV CLASS)	T1
	8	Types of DC motors and their characteristics	T1
	9	Types of DC motors and their characteristics	T1
	10	Speed control of DC motors	T1
	11	Speed control of DC motors	T1
	12	Applications (AV CLASS)	T1
<b>UNIT II TRANSFORMER</b>			
III	13	Introduction	T1
	14	Single phase transformer construction and principle of operation (AV CLASS)	T1
	15	EMF equation of transformer	T1
	16	Transformer no-load phasor diagram	T1
	17	Transformer on-load phasor diagram	T1
	18	Transformer on-load phasor diagram	T1
IV	19	Equivalent circuit of transformer	T1
	20	Equivalent circuit of transformer	T1
	21	Regulation of transformer	T1
	22	Transformer losses and efficiency	T1
	23	All day efficiency	T1
	24	auto transformers	T1
<b>UNIT III INDUCTION MACHINES AND SYNCHRONOUS MACHINES</b>			
V	25	Principle of operation of three-phase induction motors	T1
	26	Construction –Types (AV CLASS)	T1
	27	Equivalent circuit	T1
	28	Construction of single-phase induction motors	T1
	29	Types of single phase induction motors	T1
	30	Double revolving field theory	T1
VI	31	starting methods	T1
	32	Principles of alternator	T1
	33	Construction details – Types (AV CLASS)	T1
	34	Equation of induced EMF – Voltage regulation	T1
	35	Methods of starting of synchronous motors – Torque equation	T1
	36	V curves – Synchronous motors	T1

<b>UNIT IV      BASICS OF MEASUREMENT AND INSTRUMENTATION</b>			
VII	37	Static and Dynamic Characteristics of Measurement	T2
	38	Static and Dynamic Characteristics of Measurement	T2
	39	Errors in Measurement	T2
	40	Classification of Transducers (AV CLASS)	T2
	41	Variable resistive – Strain gauge	T2
	42	thermistor RTD	T2
VIII	43	transducer - Variable Capacitive Transducer	T2
	44	Capacitor Microphone	T2
	45	Piezo Electric Transducer	T2
	46	Variable Inductive transducer	T2
	47	LVDT, RVDT (AV CLASS)	T2
	48	LVDT, RVDT (AV CLASS)	T2
<b>UNIT V      ANALOG AND DIGITAL INSTRUMENTS</b>			
IX	49	DVM, DMM (AV CLASS)	T2
	50	DVM, DMM (AV CLASS)	T2
	51	DVM, DMM (AV CLASS)	T2
	52	Storage Oscilloscope (AV CLASS)	T2
	53	Comparison of Analog and Digital Modes of operation	T2
	54	Application of measurement system, Errors	T2
X	55	Measurement of R, L and C, Wheatstone	T2
	56	Kelvin, Maxwell,	T2
	57	Anderson, Schering and Wien bridges	T2
	58	Anderson, Schering and Wien bridges	T2
	59	Measurement of Inductance, Capacitance, Effective resistance at high frequency	T2
	60	Q-Meter	T2

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