

SEVENTH SEMESTER

Electrical Machine III (EL20711)

Objectives:

- To introduce the concepts of ideal synchronous machines and poly-phase induction machines.
 - Applications which will be utilized in the electrical machines with its performance and theory of operation.
 - Study of special machines.
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Syllabus:

UNIT I: Theory of Ideal Synchronous Machines

The ideal synchronous machine, synchronous machine inductances, transformation to direct and quadrature axis variables, basic machine relation in dq variables, steady state analysis using dq0, transient analysis, three-phase short circuit, transient power angle characteristics, effect of additional rotor circuits.

UNIT II: Theory of Ideal Poly-Phase Induction Machines

The ideal induction machine, transformation to dq variables, basic machine relation in dq variables, steady state analysis using dq0, electrical transients in induction machine, single phasing of three-phase induction motor, power invariance.

UNIT III: Fractional Horse Power Motor

Qualitative examination, starting and running performance of single phase induction motor, revolving field theory of single-phase induction motor, AC tachometer, unbalanced operation of symmetrical two-phase machine, the symmetrical component concept, two-phase control motors.

UNIT IV: AC Commutator Motors

Rotational EMFs in commutator windings, action of commutator as frequency converter, effect of EMF injection in secondary circuit of three-phase slip-ring induction motor, secondary (slip) power, constant HP and constant torque drives, Kramer and Scherbius system of speed control, single-phase series motors, universal motors, phasor diagrams, methods of improving commutation.

UNIT V: Special Motors

Hysteresis motor, reluctance motor, stepper motor, Synchros and linear induction motor, Permanent magnet brushless DC motor.

Text Books:

1. “*Electrical machines*”, Fitzgerald and Kingsley, 2nd edition, McGrawHill.
2. “*Performance and design of AC commutator machines*”, E. O. Taylor.

Reference Books:

1. “*Generalized theory of electrical machines*”, Bimbhra, Khanna Pbs.
2. “*Power system stability*”, Kimbark, vol-3, Wiely
3. “*General theory of electrical machines*”, Adkins.

Course Outcomes:

After the completion of the course the student will be able to:

- Explain the theory of ideal synchronous machines and, basic machine relation.
- Analyze and apply the concept of steady state analysis and electrical transients in polyphase machines.
- Examine the starting and running performance of single phase induction motor and revolving field theory.
- Make use of various speed control system for AC motors.
- Evaluate the basic operation and performance of special machines and can select special machines for different purpose.

COs \ POs	POs										
	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓	✓		✓				✓	✓
2	✓	✓	✓	✓		✓				✓	✓
3	✓	✓	✓	✓		✓				✓	✓
4	✓	✓	✓	✓		✓				✓	✓
5	✓	✓	✓	✓		✓				✓	✓

Electrical Machine-III Lab (EL20711)
B.Tech. (Electrical Engineering) VII Semester

List of Experiments

1. To determine the negative sequence reactance of synchronous machine by rotating test.
2. Determination of negative sequence reactance synchronous machine by line to line short circuit test.
3. To determine the negative sequence reactance of three phase alternator by static test.

4. To perform slip test on three phase alternator to determine X_d & X_q .
5. Open circuit and short circuit tests on a 3- Phase alternator for determination of positive sequence reactance.
6. To determine the zero-sequence impedance of a star-delta transformer.
7. To determine Zero Sequence reactance of 3- Phase alternator.
8. To determine zero sequence reactance of 3- Phase induction motor
9. Synchronization of alternator with grid (infinite bus).
10. To determine equivalent circuit parameters of a single- phase induction motor by performing no load and blocked rotor tests.

Course Outcomes (COs):

After the completion of the course the student will be able to:

- Demonstrate and explain the various methods of determination of negative sequence reactance of an alternator.
- Demonstrate and execute the experimental determination of zero sequence reactance of 3-phase alternator, 3- phase induction motor and 3 -phase transformer.
- Show and utilize the various methods of determination of positive sequence d- axis reactance (X_d) and q -axis reactance (X_q).
- Experiment with synchronization of 3- phase alternator with the grid using various methods of synchronization.
- Evaluate the various parameters of 1-phase Induction motor and analyze the performance.

POs. COs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓		✓					✓	✓
2	✓	✓	✓		✓					✓	✓
3	✓	✓	✓		✓					✓	✓
4	✓	✓	✓		✓					✓	✓
5	✓	✓	✓		✓					✓	✓

Management Concepts and Techniques (EL20712)

Objectives

- To understand the leadership skill and distinguish between leader and manager.
- To develop managerial skills and to learn how to manage at different levels and areas.

Syllabus:

UNIT I

Basic management and techniques: Planning, nature purpose and objectives of planning organizing nature and purpose of organizing, authority and responsibility, staffing, supply of human resources, performance appraisal, controlling, system and process of controlling, control techniques.

Human resource management: nature and scope of human resource planning, training and development, recruitment and selection, career growth, absenteeism, grievances, persuasion, reward and punishment .Theories of motivation and their relevance. Communication. Leadership types of leaders, leadership styles roles and functions of leaders, group and team working. Understanding group behaviour and dynamics. Conflict Management. Innovation in Organizational Design such as Networks, centralize and distributed management system.

UNIT II

Marketing management: Concept and Analysis of Macro-business environment: marketing environment, customer markets and buyer behaviour, marketing mix, advertising and sales promotion, channels of distribution, Indian and global(E-business), Directions of change and impact on business decision, Liberalization, Globalisation and Corporatisation Problems and Prospects. Financial management and accounting concepts: book keeping, financial statements analysis, financial ratios, capital budgeting, and breakeven analysis.

UNIT III

Production/operations management: planning and design of production and operations systems, facilities planning, location, layout and movement of materials, materials management and inventory control, maintenance management, PERT and CPM. Supply Chain Management-Vendor Evaluation and Audit. Quality Management

UNIT IV

Management information systems: role of information in decision making, information system planning, design and implementation, evaluation and effectiveness of the information system, statistical quality control, total quality management and ISO certificate, ISI certificate, System Development-Overview of Systems and Design. System development Management life-cycle, Designing on-line and Distributed environments.

UNIT V

Social and ethical issues in management: ethics in management, social factors, unfair and restrictive trade practices.

Strategic and technology management: need, nature, scope and strategy SWOT analysis, value chain concept.

Text Books:

1. *“Industrial management and engineering economics”*, K. C. Arora, Khanna Pbs.

2. “Industrial engineering and production management”, MartandTelsang, S. Chand
3. “Industrial management and organization”, Ahuja, Khanna Pbs.
4. “Industrial engineering and management, O. P. Khanna, DRD
5. “Industrial management”, ankurchabra

Reference Books:

1. “Industrial organization and management”, Ramchandran, RamanaMuthry, TMH.
2. “Management science”, Ramchandra, TMH.
3. “Industrial engineering and production management”, Mahajan, DRP.
4. “Management theory and practice”, Chandan, VikasPbs.

Course Outcomes:

After the completion of the course the student will be able to :

- Develop an ability to enhance the managerial skills, positive thinking, leadership qualities, manage groups and motivate team member.
- Demonstrate ability to understand marketing and financial management.
- Apply the concepts of marketing information system, quality management and ISO certification.
- Explain and analyze the functions of management for production and operation.
- Adopt the different ethical and social issues in management

PO'S \ CO'S	a	b	c	d	e	f	g	h	i	j	k
1	✓				✓		✓	✓	✓	✓	
2	✓				✓		✓	✓	✓	✓	
3	✓				✓		✓	✓	✓	✓	
4	✓				✓		✓	✓	✓	✓	
5	✓				✓		✓	✓	✓	✓	

Process Control (EL20734)

Objectives

- To understand the various process and their control in industries.
- To develop the knowledge of advance control strategies with their applications.

Syllabus:

UNIT – I

Special characteristics of process systems large time constraints, interaction, multistage, pure lag, control loops for simple systems and their Dynamics & stability.

UNIT – II

Generation of control action in electronic and pneumatic controllers, control valves, valves positiners, relief and safety valves, relays, volume boosters, pneumatic transmitters for process variable, Tuning of controllers – Zeigler Nichols and other techniques.

UNIT – III

Different control techniques and interaction of process parameters e.g. feed forward, cascade, ratio, override controls, batch continuous process controls, Feed forward Control scheme.

UNIT – IV

Various process schemes / unit operations and their control schemes e.g. distillation columns, absorbers, heat exchangers, furnaces, reactors, mineral processing industries, etc. Use of control schemes for process optimization.

UNIT – V

Advanced control strategies with case studies, Use of DDC and PLC, Introduction to supervisory control, Conversion of existing control schemes in operating plants, data loggers.

Text Books:

1. “*Industrial Process Control system*”, Dale Patrick, Stephen Fardo,.
2. “*Principal & Practiced Automatic Process Control*” Smith C.A. & A.B. Corripio, J.Willey.

Reference books:

1. “*Process control System*”, Shinsky F.G. III Ed. McGraw Hill
2. “*Process Control Engg.*” Rao M & S.QivGorden & Breach

Course Outcomes:

After completion of course the student will be able to:

- Model the variable physical processes.
- Assess the various controller designs and methods of controller tuning.
- Elaborate various complex control schemes, characteristics and application of control valves.
- Demonstrate advance control systems like PLC, SCADA.

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓			✓			✓		✓	✓
2	✓	✓			✓			✓		✓	✓
3	✓	✓			✓			✓		✓	✓
4	✓	✓			✓			✓		✓	✓

High Voltage Engineering (EL20713)

Objectives:

- Understanding the breakdown phenomenon of insulating materials used in electrical system.
 - Various high voltage generation and measuring techniques.
 - Quality evaluation through testing methodologies in high voltage engineering.
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Syllabus:

UNIT I: Breakdown in Gases

Gases as insulating media, Ionization processes, Electron avalanche, Townsend's criterion for breakdown, streamer theory of breakdown, Gaseous discharge in uniform field, Paschen's law, Breakdown in non-uniform field, corona discharges, effect of polarity on corona & breakdown voltage. Corona in transmission lines, Empirical formulae for corona loss, Methods of reducing corona loss.

UNIT II: Dielectrics

Liquid Dielectrics: conduction & breakdown in pure liquids and commercial liquids, Methods for determination of breakdown strength. Factors affecting dielectric strength of liquids.

Solid Dielectrics: -Breakdown mechanism, Intrinsic breakdown, Electromechanical breakdown, thermal breakdown, breakdown of solid dielectric in practice, Breakdown due to treeing & tracking, breakdown due to the internal discharges.

UNIT III: Generation of high voltages

Generation of high D.C. voltages, half wave & full wave rectifier circuits, Voltage doublers and multiplier circuits Van De Graff generators, Electro-static Generators, Generation of high alternating voltages, cascade transformers, Resonant transformer, Generation of impulse voltages, Standard impulse wave shapes, Analysis of model, Multistage Impulse generator, Marx circuit, Tripping & control of Impulse generators

UNIT IV: Measurement of high Voltages

Measurement of high AC and DC voltages by micro ammeter, Resistance and potential divider, series Impedance voltmeter, series capacitance voltmeter capacitance potential dividers & capacitance voltage transformers, Resistance potential dividers, Generating voltmeters, Electrostatic voltmeter, Spark gap for measurement of high D.C., A.C. & impulse voltages, Potential divider for impulse voltage measurements, CRO for impulse voltage measurements.

UNIT V:High Voltage Testing of Electrical Apparatus:

Test on insulators, Dry & wet flash Over tests & withstand tests, Impulse flash over & withstand voltage test, High voltage tests on cables Impulse testing of transformers.

Non-Destructive Testing: Measurement of dielectric constant & loss factor, High voltage Schering Bridge, Partial Discharge Measurements.

Text Books:

1. “High Voltage Engineering” by M.S. Naidu &V.Kamraju, TMH Pbs.
2. “High Voltage: Engineering fundamentals”, Kuffel E ., Butterworth-Heineman, 2000.

Reference Books:

1. “High voltage Insulation Engineering”, RavindraArora, New Age International.
2. “High Voltage Engineering” , Dr.R.S.Jha, DhanpatRai& Sons.
3. “High Voltage Engineering”, Wadhawa, C.L.; Wiley Eastern Ltd, New Age Ltd, India, 1995.
4. “Extra High Voltage A.C. Transmission Engineering”, R.D. Begamudre Wiley Eastern Limited.
5. “High voltage Engineering”, D. V. Razevig and Chaurasia, khannapbs.
6. “An introduction to high voltage engineering”, Subir Ray, PHI.

Course Outcomes:

After the completion of the course the student will be able to:

- Understand high voltage breakdown phenomena in insulating materials.
- Know the methods to generate different high voltages ac, dc and impulse.
- Know the measurement methods of high voltages ac, dc and impulse.
- Analyze the test procedures of different electrical apparatus as per the standards.

POs \ COs	a	b	c	d	e	f	g	h	i	j	k
1		✓	✓	✓		✓		✓	✓	✓	✓
2		✓	✓	✓		✓		✓		✓	✓

3		✓	✓	✓		✓		✓		✓	✓
4		✓	✓	✓		✓		✓	✓	✓	✓

High Voltage Engineering Lab (EL20722)
B.Tech. (Electrical Engineering) VIIth Semester

List Of Experiments

1. Introduction to 100 kV high voltage AC/DC set
2. To study the 100kV capacitance divider for measurement of high ac and dc voltage.
3. To study the horn gap apparatus.
4. To determine the breakdown strength of transformer oil.
5. To determine the breakdown characteristics of air under the influence of uniform and non-uniform ac field using sphere-sphere gap apparatus.
6. To determine the breakdown characteristics of air under the influence of uniform and non-uniform ac field using rod-gap apparatus with different electrode configurations.
7. To determine breakdown strength of air using plate-plate gap apparatus.
8. To determine the breakdown characteristics and study the effect of polarity of the high voltage dc in the breakdown strength of air using sphere-sphere gap apparatus.
9. To determine the breakdown characteristics and study the effect of polarity of the high voltage dc on flashover characteristics between different types of electrodes using rod-gap apparatus.
10. To study the components, control and operation of 150kv, 1.2/50 μ s, 225j impulse generator.
11. To determine the dissipation factor (tan-delta) and resistivity of the oil sample using ODF meter / IR tester and oil heater.
12. To determine breakdown voltage of surge or lightning arrester.
13. To determine the flashover voltage of pin type insulator.

Course Outcomes (COs):

After the completion of the course the student will be able to:

- Demonstrate the methods to generate different high voltages ac, dc and impulse.
- Apply the measurement methods of high voltages ac, dc and impulse.
- Formulate the steps involved in measurement of breakdown voltage of insulating materials with different electrode configuration under ac or dc high voltage.

- Experimentally validate the test procedures of different electrical apparatus as per the standards.

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓	✓		✓			✓	✓	✓
2	✓	✓	✓	✓		✓				✓	✓
3	✓	✓	✓	✓		✓				✓	✓
4	✓	✓	✓	✓		✓			✓	✓	✓