CHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

COURSE OF STUDY AND SCHEME OF EXAMINATION OF DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING

SEMESTER - V

S No.	Board of Study	Subject Code	Subject	Period per week			Scheme of Examination					Total Marks	Credit L+(T+P)/2
							Theory			Practical			
				L	T	P	ESE	CT	TA	ESE	TA		
1	Electrical	224511 (24)	Instrumentation & Control	3	1	-	100	20	10	-	-	130	4
2	Electrical	224512 (24)	Estimation and Costing	3	1	-	100	20	10	-	-	130	4
3	Electrical	224513 (24)	Power Electronics	4	1	-	100	20	10	-	-	130	5
4	Electrical	224514 (24)	Power System Operation and Control	3	1	-	100	20	10	-	-	130	4
5	Electrical	224515 (24)	Electrical Machines -II	4	1	-	100	20	10			130	5
6	Electrical	224521 (24)	Instrumentation & Control Lab	-	-	3	-	-	-	50	20	70	2
7	Electrical	224522 (24)	Power Electronics lab	-	-	4	-	-	-	50	20	70	2
8	Electrical	224523 (24)	Power System Operation and Control Lab	-	-	3	-	-	-	50	20	70	2
9	Electrical	224524 (24)	Electrical Machines -II	-	-	4	-	-	-	50	20	70	2
10	Electrical	224525 (24)	*Industrial Training/Report Writing, Seminar	-	-	1	-	-	-	50	20	70	1
Total				17	5	15	500	100	50	250	100	1000	31

i. L-Lecture T-Tutorial P- Practical
ESE-End Semester Exam CT-Class Test , TA-Teachers Assessment

* Industrial Training of 4 weeks will be carried out in summer vacation, after the completion of 4th semester, and evaluation will be done in fifth semester

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

1. SEMESTER : V
2. SUBJECT TITLE : INSTRUMENTATION AND CONTROL
3. CODE : 224511 (24)
4. BRANCH DISCIPLINE : ELECTRICAL ENGINEERING
5. TEACHING AND EXAMINATION SCHEME

Course code	Teaching scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
224511 (24)	3	1	-	-	100	20	10	-	-	130	4
224521 (24)	-	-	3	-	-	-	-	50	20	70	2

6. DISTRIBUTION OF MARKS AND PERIODS:

SL NO.	Chapter No.	Chapter Name	Periods	Marks
1	2	Measuring System	3	5
2	3	Transducers	10	15
3	4	Signal conditioner	10	15
4	5	Indicators And Recorders	8	15
5	6	Measurement of Physical Quantities	15	20
6	7	Material Analysis	6	10
7	8	Telemetry	7	10
8	9	Process Control	5	10
		TOTAL	**64**	**100**

7. RATIONALE

Observing the need of industries, essential efforts are made in framing the curriculum for this course. The student would be able to collect the required information for Instrumentation and control of any given small or large projects. It is therefore very essential that students be given knowledge of the basic principal of vast field of instrumentation .The curriculum broadly covers the area of measurement of physical quantities using electrical transducer , telemetry and process control.

8. DETAILED COURSE CONTENTS

Chapter – 1 Measuring System

- ?? Elements of measuring system
- ?? Block diagram
- ?? Time lag error, Distortion, Noise, Noise factor

Chapter – 2 Transducers

- ?? Importance & Characteristics
- ?? Actuating mechanism
- ?? Types & working principle
- ?? Application of Transducer (active & passive)
- ?? Moving coil, microphone, thermocouple, photoelectric, piezoelectric [variable parameter, strain guage, potentiometric, magneto strict ion]
- ?? Inductance (differential, mutual), LVDT, capacitive & frequency generating.

Chapter – 3 Signal conditioner

- ?? Purpose & classification
- ?? Input modifier, frequency range DC amplifier, chopper & instrumentation amplifier
- ?? Potentiometer & bridge devices (self balance, 8 deflecting type)

Chapter – 4 Indicators And Recorders

- ?? End devices
- ?? Types of Indicators {digital,7-segment LED, Nixie tube ,LCD}
- ?? Types of Recorders {printer, magnetic tape & floppy disc}

Chapter – 5 Measurement of Physical Quantities

- ?? Measurement of non-electrical quantities by electrical methods
- ?? Pressure measurement- Pressure actuator , Pirani guage, LVDT, Thermocouple guage, Strain guage ,Capacitive transducer
- ?? Temperature & Photoelectric Measurement –Resistance thermometer, Thermistor, Optical & Radiation Pyrometer
- ?? Flow measurement- electromagnetic flow meter
- ?? Level measurement-Potentiometer, Capacitive , Photoelectric
- ?? Speed & Vibration measurement- Frequency generating transducer, Vibration pickup
- ?? Velocity & Acceleration measurement- Frequency generating transducer, inductive and capacitive transducer

Chapter – 6 Material Analysis

- ?? Humidity
- ?? PHcell & PH meter
- ?? Gas analysis

Chapter – 7 Telemetry

- ?? Necessity & Principle
- ?? Classification of telemetry current, voltage, position, frequency & pulse
- ?? Land line& RF telemetry

Chapter – 8 Process Control

?? Definition of variables
?? Open loop & Closed loop system with Block Diagram
?? Servo-mechanism, On- Off control system

9. SUGGESTED IMPLEMENTATION STRATEGIES

Just by teaching the theoretical concepts and skills will not be sufficient to develop the estimation and costing skills in the student. A number of cases and near-to-live small and large problems of different categories of estimation for each chapter will have to be given to the students as classroom and home assignments.

10. SUGGESTED LEARNING RESOURCES

a) Textbooks mentioned in the references.
b) Catalogue, manuals etc.

11. SUGGESTED REFERENCES

S.No.	Title	Ed./ Year	Author/ Publisher
1.	Electrical & Electronics Measurement & Measuring Instrumentation		A. K . Shawhney
2.	Intrumentation & Devices		Sharma & Mani Rangan
3.	Process Control		Harriot , TMH Edition
4.	Electronic Intrumentation		Prensley, Printice Hall
5.	Mechanical & Industrial measurement		RK Jain, Khanna Publication

SUBJECT TITLE – INSTRUMENTATION AND CONTROL LAB

Practical Code: 224521 (24)
Periods: 48

12. PRACTICAL EXPERIENCES

✍✍Measurement of linear displacement by LVDT.
✍✍Measurement of liquid level by capacitive transducer
✍✍Measurement of temperature by thermocouple and thermistor
✍✍Measurement of pressure by LVDT
✍✍Measurement of PH value by PH meter
✍✍Measurement of angular displacement by capacitive transducer
✍✍Measurement of displacement inductive tranducer.
✍✍Measurement of temperature using Optical/ Radiation Pyrometer.
✍✍Measurement of pressure by strain gauges.
✍✍Measurement of Angular displacement by sync

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

1. **SEMESTER : V**
2. **SUBJECT TITLE : ESTIMATION AND COSTING**
3. **CODE : 224512 (24)**
4. **BRANCH DISCIPLINE : ELECTRICAL ENGINEERING**
5. **TEACHING AND EXAMINATION SCHEME**

Course code	Teaching scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
224512 (24)	3	1	-	-	100	20	10	-	-	130	4

6. **DISTRIBUTION OF MARKS AND PERIODS:**

SL NO.	**Chapter No.**	**Chapter Name**	**Periods**	**Marks**
1	1	Elements of estimating and costing	5	10
2	2	Domestic and industrial wiring	12	20
3	3	Domestic and industrial service connection	10	15
4	4	Overhead and underground distribution system	10	15
5	5	Estimating and costing of electrical product	10	15
6	6	Repairs/maintenance of electrical equipment	10	15
7	7	Principles of contracting	7	10
		TOTAL	**64**	**100**

7. **RATIONALE**

Observing the need of industries, essential efforts are made in framing the curriculum for this course. The student would be able to collect the required information for estimating and costing of any given small or large projects. He/she will be able to plan, draw layout and know current market rate of each component and material required. He/she will be able to estimate labour charges, overhead charges, special charges and interpret financial policy of government. For an entrepreneur, the above knowledge is very essential.

8. DETAILED COURSE CONTENTS

Chapter – 1 Elements of Estimating and Costing

- ?? Types of estimation and estimation tools
- ?? Overhead and service charges
- ?? Purchase procedure

Chapter – 2 Domestic and Industrial Wiring

- ?? Layout and wiring diagram for residential building
- ?? Layout and wiring diagram for industrial wiring
- ?? Selection of number of circuit for project as per IE rules
- ?? Estimation for residential wiring and industrial wiring
- ?? IE rules observed for above wiring

Chapter – 3 Domestic and Industrial Service Connection

- ?? Survey work for domestic and industrial service connection
- ?? Wiring diagram of domestic and industrial service connections
- ?? Specifications of materials and accessories for service connection
- ?? Estimation of service connection for domestic and industrial (1phase and 3 phase) service connections

Chapter – 4 Overhead and Underground Distribution System

- ?? Planning and layout of overhead electrical distribution
- ?? Specifications of materials and accessories for overhead project
- ?? Planning and layout of underground electrical distribution
- ?? Specifications of materials and accessories for underground project
- ?? Drawings of overhead and underground service connection
- ?? IE rules pertaining to above project

Chapter – 5 Estimating and Costing of Electrical Product

- ?? Market survey for cost of given product like D.O.L. starter, small motor, MCBs, etc.
- ?? Market survey for availability of required materials, their cost and other requirements
- ?? Validation of cost schedule

Chapter – 6 Maintenance of Electrical Equipment

- ?? Estimation of repairs, servicing and testing cost including labour cost (service charge)
- ?? Tools used for repairs & testing work
- ?? Detailed estimation and preparation of cost schedule for repair and maintenance of electric fan, automatic electric iron, single-phase transformer, mixer, D.O.L. starter etc.

Chapter – 7 Principles of Contracting

- ?? Terms, conditions and types of contract system
- ?? Types of tenders, tendering procedure and preparation of single tender
- ?? Terms and conditions of tender, procedure for inviting and scrutinizing of tender
- ?? Importance of earnest money deposit, security deposit and S.O.R.

9. SUGGESTED IMPLEMENTATION STRATEGIES

Just by teaching the theoretical concepts and skills will not be sufficient to develop the estimation and costing skills in the student. A number of cases and near-to-live small and large problems of different categories of estimation for each chapter will have to be given to the students as classroom and home assignments.

10. SUGGESTED LEARNING RESOURCES

c) Textbooks mentioned in the references.
d) Catalogue, manuals etc.

11. SUGGESTED REFERENCES

S. No.	Title	Ed./ Year	Author/ Publisher
1	Electrical estimating and costing	1995	Bajpai, M.N., Saroj Publication, New Delhi
2	Electrical costing, estimating and contracting	1994	Bhattacharya, S.K., TTTI, Chandigarh
3	I.E. rules	1990	Central Law Agency, Allahabad
4	S.O.R	1998	P.W.D. Govt. Deptt.
5	Electrical wiring, estimating and costing	1996	Uppal, S.L., Khanna Publisher, New Delhi

12. LIST OF PROJECTS :

a) Prepare detailed tender able specifications
b) Prepare purchase orders
c) Estimating and costing of a domestic installation cost (Residential building, laboratory room or drawing hall etc) using concept of illumination design
d) Estimating and costing of a industrial installation (work shop, agriculture, flour mill etc.) using concept of illumination design
e) Estimating and costing of overhead service connection (single phase and three phase)
f) Estimating and costing of overhead, 440V, 3-phase, 4/3 wire distribution line
g) Estimating and costing of underground service connection (single phase and three phase)
h) Estimating and costing of underground, distribution line using 3 core or 4 core cable for a connected load
i) Estimating and costing of any one electrical product/equipment
j) Estimating and costing of repairs and maintenance of any one domestic appliances
k) Prepare tender notices for given projects

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

1 SEMESTER : V
2 SUBJECT TITLE : POWER ELECTRONICS
3 CODE : 224513 (24)
4 BRANCH DISCIPLINE : ELECTRICAL ENGINEERING
5 TEACHING AND EXAMINATION SCHEME

Course code	Teaching scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
224513 (24)	4	1	-	-	100	20	10	-	-	130	5
224522 (24)	-	-	4	-	-	-	-	50	20	70	2

6 DISTRIBUTION OF MARKS AND PERIODS:

SL NO.	Chapter No.	Chapter Name	Periods	Marks
1	1	Power Rectification	05	08
2	2	Controlled Rectification	10	12
3	3	Inverters	10	10
4	4	Converters	10	15
5	5	Regulated Power Supply	15	20
6	6	Speed Control of Motors	15	15
7	7	Microprocessor and Computers	15	20
		TOTAL	**80**	**100**

7 RATIONALE

The field of electronics is very vast and fastly developing. In modern industries most of the machines are electronically operated and controlled. It is therefore very essential that technicians are given a sufficient back ground of the subject. Power electronics to keep in pace the modern developments. Basic idea about microprocessor and microcontoller has also been included in the syllabus taking to the modern trend and application of computers in every field.

8 DETAILED COURSE CONTENTS

Chapter – 1 Power Rectification

- ?? Need and advantages of polyphase rectification
- ?? 3 Phase and 6 Phase H.W. and F.W. (bridge) rectifiers
- ?? Derivation of Irms, Idc, Ripple factor, P.I.V. and efficiency for 3 ph. H.W. and F.W. rectifiers.
- ?? Different transformers – double star, zig zag and branched connections – working and advantages .
- ?? Transformer utility factor : PUF and SUF

Chapter – 2 Controlled Rectification

- ?? Power controlling devices such as S.CR, and Triac Diac UJT
- ?? Triggering circuits – phase shift, UJT, Schmitt trigger circuits
- ?? Single phase, three phase H.W. and bridge rectifiers- Derivation of Idc and Irms .
- ?? Applications of controlled rectifiers
- ?? Series and parallel combination of SCRs.

Chapter – 3 Inverters

- ?? Need of invertion
- ?? Invertor circuits using SCR in series and pareller mode
- ?? Circuit diagram of emergency tube light.

Chapter – 4 Converters

- ?? Need of converter , types of converter (DC to DC and AC to AC)
- ?? Block diagram of chopper
- ?? Circuit diagrams of chopper using switching transistors and SCRs
- ?? Need of commutation, methods
- ?? Single phase and Three phase cycloconverter

Chapter – 5 Regulated Power Supply

- ?? Need of regulation
- ?? Zener regulated DC power supply and it's limitations
- ?? Working of shunt and series regulated power supply using transistor
- ?? IC regulated power supplies (Circuit diagram)
- ?? Block diagrams of (SMPS) switch mode power supply
- ?? AC stabilizer using tap changer
- ?? Block diagram of servo stabilizer.

Chapter – 6 Speed Control of Motors

- ?? Advantages of speed control
- ?? Separately excited DC motor by single and three phase controlled rectifiers

?? Methods of speed regulation , field failure protection, armature current limiter (block diagrams)
?? Dual rectifier for reversal of rotation
?? Speed control by chopper (block diagram)
?? Circuit diagram of speed control of single phase and three phase induction motor by cycloconverter (Slip ring).

Chapter – 7 Microprocessor and Computers

?? Concept of microprocessor
?? Structure , block diagram, function of various units (8085)
?? Concept of microcomputer, Input and output devices , classification and computer applications
?? Introduction to CNC Machine and PLC (Programmable logic controller)
?? Introduction to advance microprocessor and micro controller

10 SUGGESTED LEARNING RESOURCES

a) Textbooks mentioned in the references.
b) Catalogue, manuals etc.

11 SUGGESTED REFERENCES

S.No.	Title	Ed./ Year	Author/ Publisher
1	Industrial Electronics and Instrumentation	Latest Edition	B.K.M. John (Khanna Pub)
2	Industrial Electronics	,,	Chute & Chute (McGraw Hills Pub)
3	Industrial Electronics	,,	Benedict & weier (Prentice Hall of India Pub)
4	Introduction to thrusters and their applications	,,	Ramamurti (east west press Pub)
5	Industrial Electronics	,,	Bhimra
6.	Digital Computer Electronics	,,	Malvino (Tata McGraw Hills Pub)

SUBJECT TITLE – POWER ELECTRONICS LAB

Practical Code: 224522 (24)
Periods: 64

PRACTICAL EXPERIENCES

1. Study of poly phase rectifiers; 3 phase, 6 phase , 3 phase bridge, tracing of wave forms, measurement of peak, r.m.s. average values and ripple frequency and ripplo r.m.s. values, using CRO

2. Study of series regulated D.C. power supply find its load regulation.
3. Speed control of single phase induction motor wing triac.
4. Speed control of DC shunt motor using controlled rectifier.
5. Study of AC stabilizer / servo stabilizer .
6. Study of microprocessor and micro controller .
7. Implementation of microprocessor and I/Os on bread board .

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

1. SEMESTER : V
2. SUBJECT TITLE : POWER SYSTEM OPERATION & CONTROL
3. CODE : 224514 (24)
4. BRANCH DISCIPLINE : ELECTRICAL ENGINEERING
5. TEACHING AND EXAMINATION SCHEME

Course code	Teaching scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
224514 (24)	3	1	-	-	100	20	10	-	-	130	4
224523 (24)	-	-	3	-	-	-	-	50	20	70	2

6. DISTRIBUTION OF MARKS AND HOURS:

SL NO.	Chapter No.	Chapter Name	Hours	Marks
1	1	Introduction to power system	5	5
2	2	Representation of power system	13	25
3	3	Symmetrical Components	17	30
4	4	Power System Stability And Reliability	10	15
5	5	Circle Diagram	10	15
6	6	Economic Operation of Power System	5	5
7	7	Load Flow Study	4	5
		TOTAL	**64**	**100**

7. RATIONALE

A large number of electrical Diploma holders find job opportunity in power supply undertaking in the country .The job requirement is operation, control of various power system components. So to cater the need of power supply undertakings, industries and the need of this specific job requirement. The subject Power System Operation & Control finds a place in the curriculum of electrical engineering diploma.

The curriculum has been designed to meet the requirement of a technician engineer , so that he can skillfully handle the problems of the power system .

8. DETAILED COURSE CONTENTS

Chapter – 1 **Introduction to power system**

- ?? Growth of power system
- ?? Various elements of power system
- ?? Necessity and advantages of interconnection

Chapter – 2 **Representation of power system**

- ?? Single line diagram with standard symbol.
- ?? Definition and advantages of Per Unit system
- ?? Conversion of PU values from one base value to other base value
- ?? Generalized ABCD constants and their characteristics
- ?? Values of constants in terms of circuit parameters.
- ?? Proof of (AD-BC)=1
- ?? Relation of Zso, Zss, Zro, Zrs

Chapter – 3 **Symmetrical Components**

- ?? Operator a and j
- ?? Resolution of unbalanced three phase system in to balanced three phase system
- ?? Relation between Symmetrical and unsymmetrical components
- ?? Phase sequence impedance and network
- ?? Analysis of L-G, L-L, L-L-G and L-L-L and their calculation

Chapter – 4 **Power System Stability And Reliability**

- ?? Meaning & Necessity of stability
- ?? Types of stability & Factors affecting stability
- ?? Stability limit & Methods of improving stability
- ?? Elementary two M/C system
- ?? Power angle cycles
- ?? Equal area criterion, Swing equation
- ?? Reliability & factors affecting reliability
- ?? Methods of improving reliability

Chapter – 5 **Circle Diagram**

- ?? Importance of circle diagram
- ?? Receiving end & Sending end circle diagram
- ?? Methods of voltage control- Regulating transformer & Static VAR Compensation

Chapter – 6 **Economic Operation of Power System**

- ?? Incremental fuel cost
- ?? Optimum Loading on two units in a plants
- ?? Transmission loss as a function of plant generation
- ?? Unit commitments
- ?? Beta – loss coefficients & numerical practice

Chapter – 7 **Load Flow Study**

- ?? Objectives of load flow

?? Bus classification
?? Qualitative interpretation of SLFE & its solution

Chapter – 8 HVDC/HVAC System

?? Merits & Demerits
?? Types of DC links
?? Controlled Rectification & Filters
?? Reactive Power requirements
?? Controlled characteristics

9. SUGGESTED IMPLEMENTATION STRATEGIES

Some sections of this course like relays and instrument transformers could be taught in the classrooms by actually bringing the real things and explaining the various aspects. Some of the other aspects like circuit interrupting devices could be taught in the classrooms showing photographs and transparencies and taking them for field visits later. This will enhance the understanding.

10. SUGGESTED LEARNING RESOURCES

a) Textbooks mentioned in the references.
b) Laboratory manuals
c) Laboratory workbook, worksheet etc.

11. SUGGESTED REFERENCES

S. No.	Title	Ed./ Year	Author/ Publisher
1.	Power System Protection and Switchgear	1994	Badriram/ Tata McGraw-Hill, New Delhi
2.	Electric Power System	1991	Ashfaq Hussain
3.	Electrical Power System	1996	Mehta, V.K., Khanna Publishers, New Delhi
4.	Testing, Commissioning, Operation and Maintenance of Electrical Equipment	3rd 1996	Rao, S. Tata McGraw-Hill, New Delhi
5.	ABS Course in Electrical Power	1994	J. B. Gupta , Kalson Pub. ,Ludhiana
6.	ABS Course in Electrical Power	1995	Soni , Gupta , Bhatnagar ,Dhanpat Rai & Sons
7.	Electrical Power	1995	Uppal, S.L., Khanna Pub. New Delh9

SUBJECT TITLE – POWER SYSTEM OPERATION & CONTROL LAB

Practical Code: 224523 (24)
Periods: 48

12. PRACTICAL EXPERIENCES

a) Operate air break switch in a simulated condition
b) Read and interpret the protection scheme for an alternator in power station (from blue print and visit)
c) Read and interpret various protective scheme used for transmission lines and feeders (from blue print and visit)
d) Draw schematic diagram of protective schemes for 66KV, 132KV, 220KV sub station (after visit)
e) Visit a substation and prepare its technical report emphasizing on control side.

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CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

1 SEMESTER : V
2 SUBJECT TITLE : ELECTRICAL MACHINES -II
3 CODE : 224515 (24)
4 BRANCH DISCIPLINE : ELECTRICAL ENGINEERING
5 TEACHING AND EXAMINATION SCHEME

Course code	Teaching scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
224515 (24)	4	1	-	-	100	20	10	-	-	130	5
224524 (24)	-	-	4	-	-	-	-	50	20	70	2

6 DISTRIBUTION OF MARKS AND PERIODS:

SL NO.	Chapter No.	Chapter Name	Periods	Marks
1	1	Introduction of A.C. Machines	10	5
2	2	Basic features of A.C. Machines	15	10
3	3	Alternators	20	30
4	4	A.C. Motors	20	35
5	5	FHP Motors	15	20
		TOTAL	**80**	**100**

7. RATIONALE

This course is classified under basic technology group and is intended to enable the student understand the facts, concepts, principles and procedure of operation & control of electric machines and applications of electrical energy in manufacturing industry, which will enable him/her to work effectively as a supervisor in any organization. AC machines are widely used in various applications like blowers, water pumping stations, etc. This course will help the student to function confidently in his/her career.

8. DETAILED COURSE CONTENTS

Chapter – 1 Introduction to A.C. Machines

- ?? Overview of AC machines
- ?? Difference between A.C. & D.C. Machines

Chapter – 2 Basic Features of A.C. Machines

- ?? Parts of A.C. Machine & their functions
- ?? Materials used for the various parts
- ?? Stator & rotor windings

Chapter – 3 Alternators

- ?? Types of alternators
- ?? Principle & emf equation
- ?? Winding factors & its effect on induced emf
- ?? Effect of frequency on induced emf
- ?? Effect of speed & excitation on induced emf
- ?? Different excitation systems
- ?? Excitation system used in modern alternators
- ?? Concept of leakage, armature & synchronous reactance
- ?? Principle of working of brushless alternators
- ?? Applications.

Chapter – 4 A.C. Motors

- ?? Types of A.C. motors
- ?? Stator & rotor parts, functions, windings
- ?? Concept of rotating magnetic fields
- ?? Stator & rotor current equations
- ?? Effect of frequency on slip
- ?? Torque equations
- ?? Condition for maximum torque
- ?? Torque speed curves
- ?? Circle diagram
- ?? Necessity of induction motor starters and different types
- ?? Methods of speed control of induction motors
- ?? Different types of induction motors

Chapter – 5 FHP Motors

- ?? Construction of Fractional Horse Power (FHP) motors
- ?? Starting methods of Fhp Motors
- ?? Principle of working of FHP motors
- ?? Application of Fhp Motors

9. SUGGESTED IMPLEMENTATION STRATEGIES

The implementation strategy to teach this course should be a good mix of the various teaching methods like lecture, question-answer, assignment and lab work. More drill and practice of numerical will be useful. Home and classroom assignments would prove more useful to develop the analytical skills.

10. SUGGESTED LEARNING RESOURCES

a) Textbooks mentioned in the references.
b) Laboratory manuals
c) Work sheet, workbook etc.

11. SUGGESTED REFERENCES

S.No.	Title	Ed. / Year	Author & Publisher
1.	Electrical Machines	1997	Bhattacharya, S.K., Tata McGraw-Hill, New Delhi
2.	Electrical Machines	1996	Bimbhra, P.S.; Khanna Publishers, New Delhi
3.	Elementary Electrical Engineering	18th, 1992	Gupta, M.L., New Heights, New Delhi
4.	Basic Electrical Engineering	1990	Mittle, V.N., Tata McGraw-Hill, New Delhi
5.	Electrical Machines	1995	Nagrath & Kothari, Tata McGraw-Hill, New Delhi

SUBJECT TITLE – ELECTRICAL MACHINES –II LAB

Practical Code: 224524 (24)
Periods: 64

12. LABORATORY EXPERIENCES

a) Performance of three-phase alternator.
b) Effect of speed & field current on induced emf.
c) Effect of unbalanced loading.
d) Measurement of slip by different methods
e) Performance of three phase induction motor (no load test and load test)
f) Control of three phase induction motor (speed & direction of rotation)
g) Determine Torque speed curves of three phase induction motor
h) Performance of single phase induction motor (no load test and load test)
i) Control of single phase induction motor (speed & direction of rotation)
j) Performance of FHP motors (no load test and load test)
k) Control of FHP motors (speed & direction of rotation)

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