



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
Diploma (Electrical Engineering)
(2021-2024)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTEE601	DCC	Control System	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To give the concept of control system & its applications in various fields.
2. To learn concept of modeling of various physical systems.
3. To learn about the performance characteristics and limitations associated with various devices.

Course Outcomes:

After the successful completion of this course students will be able to

1. Demonstrate an understanding of the fundamentals of (feedback) control systems.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
3. Apply root-locus technique to analyze and design control systems.
4. Determine the (absolute) stability of a closed-loop control system.

Syllabus

UNIT-I

8 Hrs.

Introduction: Basic concept of open loop and closed loop control system and their comparison- Simple Mathematical model of physical systems- Analogy between different systems-Mechanical and Electrical.

UNIT-II

8 Hrs.

Control System Representation: Transfer function, block diagram, reduction of block diagram, Mason's gain formula, Simple Mathematical problems on block diagram and signal flow graphs.

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UNIT-III

9 Hrs.

Time Domain Analysis: First and Second order control System (Without mathematical treatment)- Definition of different performance indices as delay time, rise time, peak time, percentage peak overshoot, Settling time, steady state error.-Type-0, Type -1, type-2, system definition-Concept of stability: absolute stability, relative stability-Routh and Hurwitz Criteria for stability.

UNIT-IV

8 Hrs.

Root Locus Techniques: Introduction-Root Locus concept, Construction of Root Loci.

UNIT-V

9 Hrs.

Frequency Domain Analysis: Introduction- Nyquist Stability Criteria and Bode plots of simple control system.

References:

1. I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
2. Control Systems by Ashfaq Hussain, Haroon Ashfaq, Dhanpat Rai & Co.
3. Rudra Pratap, Getting Started with MATLAB, Oxford.
4. Modern Control Systems by Roy Chaudhary. PHI
5. Feedback Control Systems by Dr. S.D. Bhide, R.A. Barapate, S. Satyanarayan, Tech-Max Publication, Pune

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List of Experiments:

1. Determination of transfer function of A-C servomotor
2. Determination of transfer function of D-C motor.
3. Study of Block diagram reduction Method using MATLAB
4. To Plot Root Locus using MATLAB.
5. To Plot Nyquist plot using MATLAB
6. To Plot Bode plot using MATLAB
7. Effect of adding poles on root loci of type-1, type-2 systems through MATLAB.
8. Effect of adding zeros on root loci of type-1, type-2 systems through MATLAB.
9. Effect of adding poles on bode plots of type-1, type-2 systems through MATLAB.
10. Effect of adding zeros on bode plots of type-1, type-2 systems through MATLAB.

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DTEE602	DCC	Installation Maintenance and Testing	60	20	20	30	20	2	0	2	3	

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Course Objectives:

1. Identify safety measures & safety precautions.
2. Testing of single phase, three phase transformer, DC & AC machine as per IS.
3. Planning of routine & preventive maintenance.
4. Analyze the condition of insulation & varnishing if necessary.

Course Outcomes:

After the successful completion of this course students will be able to:

1. Inspect, test, install & commission electrical machines as per IS
2. Understand the fundamentals of different electrical wiring.
3. Understand concepts of commissioning, maintenance, electrical safety, installation and maintenance of domestic appliances.
4. Design earthing system for residential and commercial.
5. Study the maintenance and testing of transformer and induction motor.

Syllabus

UNIT I

9 Hrs.

Safety & Prevention of Accidents

I.E. Act & statutory regulations for safety of persons & equipment working with electrical installation, Dos & don'ts for substation operators as listed in IS., Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration,

UNIT II

8 Hrs.

Maintenance

Classification and need of maintenance, Advantages of preventive maintenance, procedure for developing preventive maintenance schedule, Factors affecting preventive maintenance schedule, Introduction to total productive maintenance.

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UNIT III

9 Hrs.

Testing & Maintenance of Rotating Machines

Type tests, routine tests & special tests of 1 & 3 phase Induction motors, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992.

Parallel operation of alternators.

Testing & maintenance of Transformers: Listing type test, routine test & special test as per I.S. 2026-1981, Different methods of determining temp rise- back to back test, open delta (delta – delta) test.,

UNIT IV

9 Hrs.

Trouble shooting of Electrical Machines

Significance of trouble shooting of various electrical machines, Use of following tools: Bearing puller, Filler gauge, dial indicator, spirit level, Troubleshooting charts for Single & 3-phase induction motor, Single & 3- phase transformer.

UNIT V

9 Hrs.

Installation

Inspection procedure of Machine Installation, Installation of rotating machines as per I.S. 900-1992, Method of drying out of Machines.

Earthing

Introduction & importance, Step potential & Touch potential, Factors affecting Earth Resistance, Methods of earthing.

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1. Tarlok Singh Installation Commissioning & Maintenance of Electrical Equipments S. K. Kataria & Sons, second edition
2. Surjit Singh Electrical Installation and Estimating Dhanpatrai and sons
3. J B Gupta A course in Electrical Installation, Estimating and costing S K Kataria and Sons
4. S Rao Testing Commissioning Operation and Maintenance of Electrical Equipments Khanna Publisher
5. Er. R. N. Sahoo Hand book of Inspection, for all type of Electrical Instruments Orissa Power Generation consultants and services.

List of Practical

1. Introduction of tools and accessories for installation of electrical equipment.
2. Measurement of earth resistance by earth tester.
3. To prepare trouble-shooting chart & carry out maintenance of a single and three phase transformers.
4. Disassembling and assembling of electrical machines e.g. electric iron, electric fan.
5. Testing of transformer oil.
6. To prepare a report on specifications of earthing at different substations/different locations & new trends in earthing schemes.
7. Repair and maintenance of circuit breakers up to 11 kV.
8. Fault finding and repairing of different types of electrical wiring.
9. Trouble shooting and repair of direct on-line and star delta starter.
10. To observe & carry out periodic maintenance of D.C & A.C. motor in your workshop or laboratories & prepare its report.

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DTEE603	DCC	Electric Traction	60	20	20	0	0	3	0	0	3

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Course Objectives:

1. To provide the students the fundamental concepts of drives and types of drives used in traction.
2. To train the students with a good engineering breadth so as to analyze the accessing techniques for braking system implementation in traction.

Course Outcomes:

After the successful completion of this course students will be able to

1. Express working of Electric Drives.
2. Understand the function of the various traction system equipment.
3. Evaluate the Constituents of Supply systems in traction.
4. Select and understand the various train lighting systems.

Syllabus

UNIT I

6 Hrs.

Electric Traction System

Electric Traction – Advantages and Disadvantages, Applications. Ideal traction system. Choice of traction system in India.

UNIT II

9 Hrs.

Track Electrification

Description of various systems - D.C., 1-Phase low frequency A.C., 1-Phase high frequency, 3-Phase A.C. and Composite System, 25 K.V. A.C., 50 Hz System-Advantages and disadvantages, Problems associated with A.C traction system, current and voltage unbalance, production of harmonics and induction effects, comparison between A.C. and D.C. system

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UNIT III

9 Hrs.

Power Supply Arrangements

High Voltage Supply, Constituents of supply system substation, feeding post, feeding and sectioning arrangements, sectioning post, elementary section, Miscellaneous equipment at control posts and switching station, Major equipment at substation, transformer, circuit breaker, interrupters, Protection system for A.C. Traction.

UNIT IV

9 Hrs.

A.C. Electric Locomotive

Block diagram of A.C. electric locomotive, Overhead equipment (O.H.E.), Pentagonal O.H.E.-catenary construction, OHE Supporting structure, Current collection system, current collection gear for OHE, pole collection bow collection, pantograph collector, Air blast C.B, Tap Changer (on load), Transformer, Rectifier connection, Traction motor connection.

UNIT V

8 Hrs.

Rail Locomotive Signaling

System of train lighting, special requirements of train lighting, methods of obtaining unidirectional polarity and constant output, Battery System, Failure of under frame generating equipment.

References:

1. S. K. Pillai, "A first course on Electric Drives", 3rd edition, New Age International Publishers.
2. M. V. Deshpande, "Electrical Motors applications and control", PHI.
3. S. L. Uppal, "Electrical power", Khanna Publishers.
4. J. B. Gupta, "Electrical Power", S.K Kataria & Sons, New Delhi.
5. H. Pratab, "Modern Electric Traction", Dhanpat Rai & Sons
6. J. Upadhyay, S. N. Mahendra, "Electric Traction", Allied Publishers Ltd.

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DTEE605	DCC	Electrical Substation Practices	60	20	20	30	20	2	0	2	3

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Course Objectives:

The aim of this course is to empower the students with the necessary knowledge of substation operations and maintenance of substation equipment. This course will also be useful for students to observe the safety while working in substations as well as to improve the quality of power system.

Course Outcomes:

After the successful completion of this course students will be able to

1. Apply the safety rules in substation.
2. Maintain substation earthing and neutral grounding.
3. Understand the functions and ratings of equipment connected in substation.
4. Interpret single line diagram and layout of substation.
5. Analyze the Gas Insulated Substation.

Syllabus

UNIT I

9 Hrs.

Sub-stations and its Safety

Need of electrical Substation, Classification of Substation, selection of the site of substation, Single line diagram, conductors used, Typical earth resistance values of various substation, Structure as per as IE rules: 11 KV, 33 KV & 132 KV substation, double pole structure & transmission tower, Requirements of Electrical safety, General Safety rules.

UNIT II

8 Hrs.

11 KV Substation

Need for pole mounted and plinth mounted substation, 11KV/440 V pole mounted substation equipment and accessories, Functions and ratings of equipment connected in 11 KV substation, Layout and Single line diagram of pole mounted substation, Insulation resistance measurement.

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UNIT III

9 Hrs.

33 KV Substation

Need of 33KV/11KV substation, 33KV/11KV substation equipment and accessories, Functions and ratings of equipment connected in 33 KV substation, Layout and Single line diagram of 33KV substation, Breakdown voltage test on power transformer oil.

UNIT IV

8 Hrs.

132 KV Substation

Need of 132KV/33KV substation, 132KV/33KV substation equipment and accessories, Functions and ratings of equipment connected in 33 KV substation, Layout and Single line diagram of 132KV/33KV substation, Step potential, mesh potential, touch potential, transferred potential.

UNIT V

8 Hrs.

Gas Insulated Substation

Need of Gas Insulated substation (GIS), GIS: Essential parts, advantages, drawbacks and single line diagram, partial discharge monitoring, Safety practices during routine, preventive and breakdown maintenance of GIS, Fire fighting equipment used in GIS.

References:

1. S.Rao, "Electrical Substation Engineering and Practice Engineering & Practice EHV-AC, HVDC and SF6-GIS", Khanna Publishers Pvt. Ltd, Third edition.
2. Mcdonald J D, "Electrical Power Substation Engineering", CRC Press, Taylor and Francis, Third Edition.
3. M.V Deshpande, "Elements of Electrical Power Station Design", PHI Learning Pvt Limited.
4. V.K. Mehta "Principles Of Power System", S.Chand & Co.Ltd.

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6. M.L Soni, P.V Gupta and U.S Bhatnagar, "A Course in Electrical Power", Dhantpat rai and Co (P) Ltd.
7. G.R Nagpal, S.C Sharma, "Power Plant Engineering", Khanna Publishers.
8. Sunil S. Rao, "Switchgear Protection and Power Systems", Khanna Publishers.

List of Practical

1. Prepare report on safety precautions to be observed in substation.
2. Draw layout and prepare report on 11KV pole mounted substation earthing after seeing the relevant video clip.
3. Draw single line diagram of 11KV substation and list detailed specifications of equipment used.
4. Prepare visit report of 33KV/11KV substation and draw the layout diagram.
5. Draw single line diagram of 33KV substation and list detailed specifications of equipment used.
6. Measure the earth resistance and insulation resistance of 33KV/11KV substation.
7. Prepare Maintenance schedule of 33KV/11KV substation.
8. Draw single line diagram of 132KV substation and list detailed specifications of equipment used.
9. Draw single line diagram of 33KV Gas Insulated substation.
10. Prepare a report on maintenance of SF6 circuit breakers in substation.

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