BIJUPATNAIKUNIVERSITY OF TECHNOLOGY, ODISHA

ROURKELA

Curriculum and Syllabus

B. Tech (*Electrical and Electronics Engineering)* for the Batch

2018-19

Semester (5th)

B. Tech in Electrical and Electronics Engineering (Admission Batch: 2018-2019)

5th Semester

Theory					
Sl. No.	Category	Course Code	Course Title	L-T-P	Credit
1	PC 11		Electric Power Transmission and Distribution	3-0-0	3
2	PC 12		Control System	3-0-0	3
3	PC 13		Electrical Machines-II	3-0-0	3
			Industrial Process Control and Dynamics	3-0-0	
			Fundamentals of Communication	3-0-0	
			Advanced Digital Electronics	3-0-0	
5	PE 3		Electric Drives	3-0-0	3
			Renewable Power Generating System	3-0-0	
			Sensors and Transducers	3-0-0	
6	MC 5		Universal Human Values		0
Total Credit (Theory)					**15**
Practical					
1	PC 14		Electric Power Transmission and Distribution Lab	0-0-3	2
2	PC 15		Control and Instrumentation Lab	0-0-3	2
3	PC 16		Electrical Machines Lab-II	0-0-3	2
4	PSI 2		Evaluation of Summer Internship	0-0-3	1
Total Credit (Practical)					**7**
Total Semester Credit					**22**

5Th Semester

Electric Power Transmission and Distribution

Module I: **(4 hours)**

Evolution of Power Systems and Present-Day Scenario. Structure of power system. Conventional sources of Electrical Energy, Hydroelectric Power Generation, Thermal Power Generation and Nuclear Power Generation.

Module II: **(10 hours)**

Inductance of a Conductor due to Internal Flux, Flux Linkages between Two Points External to an Isolated Conductor, Inductance of a Single Phase Two Wire Line, Flux Linkages of one Conductor in a Group, Inductance of Composite-Conductors, Concept of GMD, Transposition of lines, Inductance of a Three Phase Line with symmetrical and Unsymmetrical Spacing, Inductance Calculations for Bundled Conductors, Skin effect and Proximity effect. Capacitance of a Two Wire Line, Capacitance of a Three Phase Line with symmetrical and Unsymmetrical Spacing, Effect of Earth on the Capacitance of a Three Phase Line, Capacitance Calculations for Bundled Conductors, Parallel- Circuit Three Phase Lines. Corona.

Module III: **(12 hours)**

Representation of Short, medium and long Transmission Line, Equivalent Circuit, Calculation and analysis of performance of transmission lines, Voltage Profile of transmission lines, Ferranti Effect, Power Flow Through Transmission Line, Power Flow capability and Surge Impedance Loading, Series and Shunt Compensation of Transmission Line.

Overhead Line Insulators: Insulator Materials, Types of Insulators, Voltage Distribution over Insulator String, Methods of Equalizing the potential.

Mechanical Design of Overhead Transmission Lines: The catenary curve, Sag TensionCalculation, supports at different levels, Stringing chart, sag Template, Equivalent span, Stringing of Conductors, Vibration and Vibration Dampers

Module IV: **(6 hours)**

Method of Symmetrical Components (positive, negative and zero sequences). Balanced andUnbalanced Faults. Representation of generators, lines and transformers in sequencenetworks. Computation of Fault Currents. Neutral Grounding.

Module V: **(10 hours)**

Classification of Distribution Systems, Primary and secondary distribution network, Voltage Drop in DC Distributors, Voltage Drop in AC Distributors, Kelvin's Law, Limitations of Kelvin's Law, Application of Capacitors to Distribution Systems.

Underground Cables: Type and construction, Classification of Cables, Parameters of Single Core Cables, Grading of Cables, Capacitance of Three Core Cable, Comparison of overhead lines with underground Cables, XLPE, PVC Cables.

Power System Earthing: Soil Resistivity, Earth Resistance, Tolerable Step and Touch Voltage, Actual Touch and Step Voltages. Single-wire Earth Return Concept in distribution system.

Books:

[1] J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.

[2] O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education, 1995.

[3] D. P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education, 4th Edition, 2011.

[4] B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 5th Edition, 2012.

[5] C.L.Wadhwa,“Electrical Power Systems”, New Age International Publishers, 6th Edition.

[6] A. R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc, 1999.

Digital Learning Resources:

Course Name:	Power System Generation Transmission and Distribution
Course Link:	https://nptel.ac.in/courses/108/102/108102047/
Course Instructor:	Prof. D P Kothari, IIT Delhi

Course Name:	Power System Engineering
Course Link:	https://nptel.ac.in/courses/108/105/108105104/
Course Instructor:	Prof. D Das, IIT Kharagpur

5Th Semester

Control System

Module I: **(5 hours)**

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of NegativeFeedback. Block diagram algebra. Signal Flow Graph and Mason's Gain formula.

Module II: **(10 hours)**

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-ordersystems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Module III: **(7 hours)**

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response: Constant M Circle, Constant N Circle, Nichols Chart.

Module IV: **(10 hours)**

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Tuning of PID controllers, Lead and Lag compensation in designs.

Module V: **(10 hours)**

Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

Books:

[1] I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.

[2] K. Ogata, "Modern Control Engineering", Prentice Hall, 1991

[3] M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.

[4] B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

Digital Learning Resources:

Course Name:	Control System Engineering
Course Link:	https://nptel.ac.in/courses/108/102/108102043/
Course Instructor:	Prof. M Gopal, IIT Delhi

5Th Semester

Electrical Machines - II

Module I: **(8 Hours)**

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; singleturn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor

Module II: **(4 Hours)**

Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

Module III: **(12 Hours)**

Three Phase Induction Motor

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.

Module IV: **(6 Hours)**

Single Phase Induction Motor

Constructional features, double revolving field theory, equivalent circuit, determination ofparameters. Split-phase starting methods and applications

Module V: **(10 Hours)**

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine – two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

Books:

[1] Stephen J. Chapman-‘Electric Machinery and Fundamentals’- Mc Graw Hill International Edition, (Fourth Edition), 2015.

[2] M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.

[3] A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, McGraw Hill Education, 2013.

[4] P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.

[5] I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

[6] A. S. Langsdorf, “Alternating current machines”, McGraw Hill Education, 1984.

[7] P. C. Sen, “Principles of Electric Machines and Power Electronics”, John Wiley & Sons, 2007

Digital Learning Resources:

Course Name:	Electrical Machine-II
Course Link:	https://nptel.ac.in/courses/108/105/108105131/
Course Instructor:	Prof. T K Bhattacharya, IIT Kharagpur

5Th Semester

Industrial Process Control and Dynamics

Module-I: **(10 Hours)**

Introduction, control systems, process control block diagram, control system evaluation, analog and digital processing. **Analog Signal Conditioning:** Introduction, principles of analog signal conditioning, passive circuits, operation, amplifiers, op-amp circuits in instrumentation

Module-II: **(10 Hours)**

Digital Signal Conditioning: Introduction, Review of digital fundamentals, converters, Data Acquisition system.

Thermal Sensors: Introduction, Definition of temperature, Metal resistance versus Temperature devices, Thermistors, Thermocouples.

Mechanical Sensors: Introduction, Displacement, Location or Position sensors, Strain sensors, Motion sensors Pressure sensors, Flow sensors

Module-III: **(10 Hours)**

Optical Sensors: Introduction, Photo detectors, Pyrometry, Optical Sources application. **Final Control:** Introduction, Final control operation, signal conversions, Industrial Electronics, Actuators, Control Elements. **Discrete State Process Control:** Introduction, Definition of Discrete State Process control, Characteristics of the system, Relay controllers and ladder diagram, PLCs. Control Loop.

Module IV **(10 Hours)**

Controller Principles: Introduction, Process characteristics, Control system parameters, Discontinuous controller modes, continuous controller modes, composite control modes. **Analog Controllers:** Electronics Controller, Pneumatic controller. **3. Digital Controllers:** Digital electronics methods, Computers in process control, Characteristics of digital data

Books:

[1] Curtis D. Johnson, "Process Control Instrumentation Technology", PHI Publication.

[2] D. R. Coughanowr, Steven LeBlanc, "Process System Analysis and Control", McGraw Hill, 3rd Edition, 2013

[3] Surekha Bhanot, "Process Control: Principle and Application", Oxford Publications

5Th Semester

Fundamentals of Communication Theory

Module-I: **(12 Hours)**

Introduction to basic elements of communication systems. Signal transmission through linear systems: condition for distortion less transmission of signals through networks. Different types of distortion and their effect on the quality of output signals, transmission of transient signals, distortion analysis.

Amplitude modulation: Modulation principle and definitions, sideband and carrier power, generation of AM signal, demodulation of AM signal. Different type of modulator circuits, square law modulator, balanced modulator. Demodulator basic principle of coherent detections, square law detectors, average envelope and peak envelope detectors. Quadrature amplitude modulation (QAM), amplitude modulation: single sideband (SSB), generation of SSB signals, selective filtering method, phase shift method, demodulation of SSB-SC signals, envelop detection of SSB signals with a carrier (SSB+C), amplitude modulation: vestigial sideband (VSB), envelop detection of VSB+C signals, noise in AM receivers using envelope detection, concept of SNR.

Module-II: **(10 Hours)**

Frequency and phase modulation: Principles and definitions, relationship between frequency and phase modulations. phase and frequency deviations, spectrum of FM signal, bandwidth considerations. Effect of modulation index on bandwidth, narrow band and sideband FM and PM principles, circuit for realization of FM and PM. Demodulation: Principle of demodulation: different type of demodulator, discriminator, use of PLL etc.

Module-III: **(10 Hours)**

Radio transmitter: Basic block diagram of radio transmitter (AM and FM), Analysis of a practical circuit diagram used for medium power transmitter.

Radio receiver: Basic block diagram of TRF, Superheterodyne principle, its advantages, Mixer principle and circuit, AVC, Radio receiver measurement.

System noise calculation: Signal to noise ratio of SSB, DSB, AM for coherent and envelope and square law detection, threshold effect. Signal to noise calculation for FM and threshold.

Books:

[1] S Haykin, “Communications Systems”, John Wiley and Sons, 2001.
[2] B. P. Lathi, “Modern Digital and Analog Communication Systems”, Oxford
[3] R. P. Singh, S. D. Sapre,” Communication Systems”, TMH, 2nd Edition

[4] Taub H. and Schilling D.L.,” Principles of Communication Systems”, TMH ,2001.
[5] Proakis J. G. and Salehi M.,” Communication Systems Engineering”, Pearson Education,2002
[6] Schaum’s Outlines,” Analog and Digital Communication”, 3rd edition

Digital Learning Resources:

Course Name:	Analog Communication
Course Link:	https://nptel.ac.in/courses/117/105/117105143/
Course Instructor:	Prof. Goutam Das, IIT Kharagpur

Course Name:	Communication Engineering
Course Link:	https://nptel.ac.in/courses/117/102/117102059/
Course Instructor:	Prof. Surendra Prasad, IIT Delhi

5Th Semester

Advanced Digital Electronics

MODULE-I **(10 Hours)**

Combinational Logic: Review of adders, Subtractor, Multipliers, Multiplexers, ROM,PLA, PAL and PLD.

Synchronous Sequential Logic: Flip-flops, Triggering of flip-flops, Analysis ofclocked sequential circuits, State reduction and assignment, Flip-flop excitationtables, Design procedure, Design of counters

MODULE-II **(08 Hours)**

Finite State Machines: Finite state model, Memory elements and their excitationfunctions, Synthesis of Synchronous sequential circuits, Capabilities and limitationsof FSM, Design, Modeling and Simulation of Moore and Mealy machines.

MODULE-III **(08 Hours)**

Asynchronous Sequential Logic: Analysis Procedure, Circuits with latches, Designprocedure, Reduction of state and flow tables, Race-free state assignment, Hazards, Design examples.

Module–IV **(12 Hours)**

Designing with Programmable Logic Devices and Programmable Gate Arrays: Read only memories, Programmable logic arrays, Programmable array logic,designing with FPGAs, Xilinx series FPGA

Algorithmic State Machines: ASM chart, Timing considerations, Controlimplementation, Control Design with multiplexers, PLAs, etc.Read only memories, Programmable logic arrays, Programmable array logic,designing with FPGAs, Xilinx series FPGA

Books:

[1] Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL design", TMH, 3rd Edition, 2008.

[2] Douglas L Perry, "VHDL: Programming by Example", TMH, 3rd Edition, 2008

[3] William I Fletcher," Digital Design Principles", PHI, 3rd edition-1980

[4] Chales H. Roth," Digital System Design Using VHDL", Cengage Learning India, 2nd Edition,2012.

[5] John Wakerley," Digital System Design", Pearson Education, 4th Edition,2008

Digital Learning Resources:

Course Name:	Digital Systems Design with PLDs and FPGAs
Course Link:	https://nptel.ac.in/courses/117/108/117108040/
Course Instructor:	Prof. Kuruvilla Varghese, IISc Bangalore

Course Name:	Digital Circuits and Systems
Course Link:	https://nptel.ac.in/courses/117/106/117106086/
Course Instructor:	Prof. S. Srinivasan, IIT Madras

5Th Semester

ELECTRIC DRIVES

MODULE I **(10 HOURS)**

Requirements, AC and DC drives, Advantages of Electrical Drives, Fundamentals ofTorque Equations, Speed Torque Conventions and Multi-quadrant Operation, Equivalent Valuesof Drive Parameters, Components of Load Torques, Calculation of Time and Energy Loss inTransient Operations, Steady State Stability, Load Equalization, Control of Electrical Drives,

Thermal Model of Motor for Heating and Cooling, Classes of Motor Duty, Determination of Motor Rating.

MODULE II **(10 HOURS)**

Steady State Performance of DC/AC Drives:DC Motors and their Performances, Starting,Braking, Transient Analysis, Speed Control, Methods of Armature Voltage Control, ControlledRectifier Fed DC Drives,Induction Motor Drives: Speed Control, Pole Changing, PoleAmplitude Modulation, Stator Voltage Control, Variable Frequency Control from VoltageSource, Voltage Source Inverter Control, Variable Frequency Control from Current Source,Current Source Inverter Control, Current Regulated Voltage Source Inverter Control, RotorResistance Control, Slip Power Recovery.

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MODULE III **(10 HOURS)**

Synchronous Motor Drives: Synchronous Motor Variable Speed Drives, VariableFrequency Control of Multiple Synchronous Motors. Electric Traction: System of electrictraction Mechanics of Train Movement: Speed- time, distance- time and simplified speed-timecurves, Attractive effort for acceleration and propulsion, effective weight, train resistance,adhesive weight, specific energy output and consumption. Traction Motors: Review of characteristics of different types of DC and AC motors usedin traction and their suitability

MODULE IV **(10 HOURS)**

Drives for specific application like Textile Mills, Steel Rolling Mills, Cranes and HoistDrives, Cement Mills, Sugar Mills, Machine Tools, Paper Mills, Coal Mines, Centrifugal Pumps.Application Areas and Functions of Microprocessors in Drive Technology.

Books:

[1] G. K. Dubey," Fundamentals of Electrical Drives", CRC Press, 2002.

[2] V.Subrahmanyam, "Electric Drives",TMH

[3] W. Leonhard," Control of Electric Drives", Springer Science & Business Media, 2001.

[4] R. Krishnan," Electric Motor Drives: Modeling, Analysis and Control", Prentice Hall 2001.

Digital Learning Resources:

Course Name:	Fundamentals of Electric Drives
Course Link:	https://nptel.ac.in/courses/108/104/108104140/
Course Instructor:	Prof. Shyama Prasad Das, IIT Kanpur

5Th Semester

Renewable Power Generating System

Module I: **(15 Hours)**

Introduction: Conventional energy Sources and its Impacts, Non conventional energy– seasonalvariations and availability, Renewable energy – sources and features, Distributed energy systemsand dispersed generation (DG). Solar Energy: Solar processes and spectral composition of solar radiation. Solar Thermal system-Solar collectors, Types and performance characteristics, Applications-Solar water heating systems(active & passive) , Solar space heating & cooling systems , Solar desalination systems, Solar cooker.Solar photovoltaic system-Operating principle, Photovoltaic cell concepts, Cell, module, array,Losses in Solar Cell, Effects of Shadowing-Partial and Complete Shadowing, Series and parallelconnections, Cell mismatching, Maximum power point tracking, Applications-Battery charging,Pumping, Lighting, Peltier cooling. Modelling of PV cell.

Module II: **(10 Hours)**

Wind Energy: Wind energy, Wind energy conversion; Wind power density, efficiency limit for windenergy conversion, types of converters, aerodynamics of wind rotors, power ~ speed and torque speed characteristics of wind turbines, wind turbine control systems; conversion to electricalpower: induction and synchronous generators, grid connected and self excited induction generatoroperation, constant voltage and constant frequency generation with power electronic controlsingle and double output systems, reactive power compensation, Characteristics of wind powerplant, Concept of DFIG.

Module III: **(9 Hours)**

Biomass Power: Principles of biomass conversion, Combustion and fermentation, Anaerobic digestion, Types of biogas digester, Wood gassifier, Pyrolysis, Applications. Bio gas, Wood stoves,Bio diesel, Combustion engine, Application.

Module IV: **(6 Hours)**

Hybrid Systems: Need for Hybrid Systems, Range and type of Hybrid systems, Case studies ofDiesel-PV, Wind-PV, Microhydel-PV, Biomass-Diesel systems, electric and hybrid electric vehicles.

Books:

[1] Godfrey Boyle“Renewable Energy- Power for a Sustainable Future”,Oxford University Press.

[2] B.H.Khan, “Non-Conventional Energy Resources”,Tata McGrawHill, 2009.

[3] S. N. Bhadra, D. Kastha, S. Banerjee, “Wind Electrical Systems”,Oxford University Press, 2005.

[4] S. A. Abbasi, N. Abbasi, “Renewable Energy Sources and Their Environmental Impact”, Prentice Hall of India, New Delhi, 2006

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Digital Learning Resources:

Course Name:	Energy Resources and Technology
Course Link:	https://nptel.ac.in/courses/108/105/108105058/
Course Instructor:	Prof. S Banerjee, IIT Kharagpur

5Th Semester

Sensors and Transducers

Module-I **(9 Hours)**

Elements of a general measurement system: Static Characteristics: systematiccharacteristics, statistical characteristics, calibration; Dynamic characteristics ofmeasurement systems: transfer functions of typical sensing elements, step and frequencyresponse of first and second order elements, and dynamic error in measurement systems.

Module-II **(8 Hours)**

Sensing elements: Resistive sensing elements: potentiometers, Resistance TemperatureDetector (RTD), thermistors, strain gages. Capacitive sensing elements: variableseparation, area and dielectric; Inductive sensing elements: variable reluctance and LVDTdisplacement sensors; Electromagnetic sensing elements: velocity sensors.

Module-III **(8 Hours)**

Thermoelectric sensing elements: laws, thermocouple characteristics, installationproblems, cold junction compensation. IC temperature sensor Elastic sensing elements:Bourdon tube, bellows, and diaphragms for pressure sensing, force and torquemeasurement.

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Module-IV **(9 Hours)**

Signal Conditioning Elements: Deflection bridges: design of resistive and reactive bridges,push-pull configuration for improvement of linearity and sensitivity. Amplifiers:Operational amplifiers-ideal and non-ideal performances, inverting, non-inverting anddifferential amplifiers, instrumentation amplifier, filters. A.C. carrier systems, phasesensitive demodulators and its applications in instrumentation.

Text Books:

[1] J.P. Bentley, “Principles of Measurement Systems”,Pearson Education, New Delhi,3rdEdition, 2007.

[2] A.K. Ghosh, “Introduction to Measurement and Instrumentation”,PHI, 3rdEdition, 2009.

Reference Books:

[1] E.O. Doeblin, “Measurement Systems Application and Design”, McGraw-Hill, International, 4thEdition.

[2] J.W. Dally, W.F. Riley and K.G.McConnel, “Instrumentation for Engineering Measurements”, John Wiley, NY, 2nd Edition 2003.

[3] T.R. Padmanabhan, “Industrial Instrumentation”, Springer, London, 2000.

Digital Learning Resources:

Course Name:	Industrial Instrumentation
Course Link:	https://nptel.ac.in/courses/108/105/108105064/
Course Instructor:	Prof. A Barua, IIT Kharagpur

Electric Power Transmission and Distribution Laboratory

List of Experiments

(Perform any 08 Experiments)

1. Study and of Ferranti Effect
2. Determination of ABCD Parameter.
3. Determination of string efficiency
4. Earth resistance measurement.
5. Series and shunt capacitance computation in transmission line
6. Transformer oil test.
7. Study of various lightning arresters.
8. Distribution system power factor improvement using switched capacitor.
9. Study of corona discharge

Digital Learning Resources:

Virtual Lab Link: http://vp-dei.vlabs.ac.in/Dreamweaver/list.html

Control and Instrumentation Laboratory

List of Experiments

(Perform any 10 Experiments)

Group-A (Control)

1. Study of a dc motor driven position control system
2. Study of speed torque characteristics of two phase ac servomotor and determination of its transfer function
3. Obtain the frequency response of a lag and lead compensator.
4. To observe the time response of a second order process with P, PI and PID control and apply PID control to servomotor
5. To determine the transfer function of a system (network) using transfer function analyser.
6. To study and validate the controllers for a temperature control system
7. To study the position control system using Synchroscope.

Group-B (Instrumentation)

1. To measure strain developed in a cantilever beam using strain gauges.
2. Study of temperature voltage characteristic of J type thermocouple
3. Measurement of linear displacement using LVDT
4. To measure unknown resistance, inductance and capacitance using different bridges.
5. Calibration of Single phase Energy meter

Digital Learning Resources:

Virtual Lab Link: http://202.3.77.143/virtuallab/login.php

Electrical Machine-II Laboratory

List of Experiments

(Perform any 08 Experiments)

1. Determination of the voltage regulation of an alternator by synchronous impedance method and zero power factor (zpf) method
2. Determination of the V and inverted V curves of a synchronous motor
3. Speed control of a three phase induction motor using variable frequency drives.
4. Determination of parameters of synchronous machine
    (a) Positive sequence reactance
    (b) Negative sequence reactance
    (c) Zero sequence reactance
5. Determination of power angle characteristics of an alternator
6. Determination of parameter of a Capacitor start single phase induction motor.
7. Study of parallel operation of two alternators
8. Measurement of direct and quadrature axis reactance of a salient pole synchronous machine by Slip test.
9. Measurement of transient and sub transient reactance of a salient pole alternator
10. Performance of grid connected induction generator.
11. Determination of parameters of three phase induction motor from No Load Test and Blocked Rotor Test.
12. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.

Digital Learning Resources:

Virtual Lab Link

http://vem-iitg.vlabs.ac.in/

http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering