Syllabus for the Academic Year – 2020 - 2021

Department: Electrical & Electronics Engineering

Semester: IV

Subject Name: DIGITAL ELECTRONIC CIRCUITS

Subject Code: PC-18EEI402 **L-T-P-C: 3-0-2-4**

Course Objectives:

1. To understand the concept of digital principles, sequential and combinational logics
2. To apply the concept of sequential and combinational circuits
3. To analyze sequential and combinational circuits
4. To design sequential and combinational circuits

UNIT	Syllabus	Hours
1	**Simplification of Boolean Functions:** Karnaugh Simplifications (upto 4 variables), POS and SOP Simplifications, The Tabulation Method, HDL Implementation models.	7
2	**Data Processing Circuits**: Multiplexers, Demultiplexers, Decoders, Encoders, Magnitude comparator, Read only memory (ROM), Programmable read only memories (PROM), Programmable logic arrays (PLA), Programmable array logic (PAL) devices. The adder-subtractor, Fast adder, HDL implementation of Data Processing Circuits and arithmetic circuits.	8
3	**Flip-Flops:** RS flip-flops, Gated Flip-flops, Edge–triggered RS flip-flops, Edge-Triggered D flip-flops, Edge-triggered JK flip-flops, Flip-flop timing, JK Master-Slave flip-flops, Switch contact bounce circuits, Various representations of flip-flops, Analysis of sequential circuits, Conversion of flip-flops, HDL implementation of flip-flop.	8
4	**Registers:** Types-SISO, SIPO, PISO, PIPO, Applications of shift registers-Ring counter, Johnson counter, Sequence Generator and Sequence detector, Serial adder, Register implementation in HDL. **Counters:** Asynchronous counters, Decoding gates, Synchronous counters, Changing the counter modulus, Decade counters, Presettable counters, Synchronous Up-down counters, Counter design as a synthesis problem, Counter design sing HDL.	8
5	**Design of Sequential Circuit (only synchronous):** Model selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram, Implementation Using ROM, Algorithmic State Machine, State Reduction Technique.FSM implementation in HDL.	8

LABORATORY EXPERIMENTS

1	Verification of Half / Full adder and subtractor. Write the Verilogcode for full adder. Simulate and verify its working.
2	Implementation of 4-variable logic expression using 8:1 MUX IC 74151. Write the Verilog code for an 8:1 multiplexer. Simulate and verify its working.
3	Realization of SR and D flip flops. Write the Verilog code for SR and D flip flops. Simulate and verify its working.
4	Realize and study Ring and Johnson counters using IC 7495. Write the Verilog code for switched tail counter. Simulate and verify its working.
5	Design an n-bit asynchronous and synchronous using IC7476 for the given modulus. Write the Verilog code for mod-8 up counter. Simulate and verify its working.

Course Outcomes:

After completion of course, student will be able to:

1. Understand the concept of digital principles, combinational and sequential logic.
2. Apply the concept of combinational and sequential logic to design the circuit.
3. Analyze sequential and combinational circuits.
4. Design sequential and combinational circuits for the given problem..

Text Book:

Digital Principles and Applications, Leach, Malvino, Saha, McGraw Hill, 8th Edition
ISBN: 9339203402

Reference Books:

1. Digital Design, Morris Mano, **PHI,** 3rd Edition
2. Digital Fundamentals, Thomas L Floyd, Pearson, **11th Edition** ISBN 13: 978-1-292-07598-3

Syllabus for the Academic Year – 2020 – 2021

Department: Electrical & Electronics Engineering

Semester: IV

Subject Name: CONTROL SYSTEMS

Subject Code: PC-18EE403 **L-T-P-C: 4-0-0-4**

Course Objectives:

1. To understand the concepts of mathematical models of physical systems, transfer functions, stability analysis and compensating networks.
2. To apply the concept of Laplace transformation and RH criteria for stability analysis.
3. To analyze the response of the system for different inputs and stability by RH criteria.
4. To evaluate the stability of the system by frequency domain analysis.

UNIT	Description	Hours
I	**Introduction and mathematical models of control systems:** Introduction, example of control systems, closed loop versus open loop control system, mechanical, translational and rotational systems, and electrical systems, electrical analogous of mechanical translational and rotational systems. (Gear trains excluded)	**10**
II	**Block diagrams and signal flow graphs:** Transfer functions, Block diagrams, Signal Flow graphs (State variable formulation excluded).	**10**
III	**Time Domain Analysis:** Time response of continuous –data systems, typical test signals for the time response of continuous systems, steady state error, unit step response & time domain specifications & transient response of a prototype second order system.	**10**
IV	**Stability Analysis:** Introduction, BIBO Stability, Methods of determining Stability & RH Criterion. Root locus technique- Basic properties of the root loci, construction of root loci.	**11**
V	**Frequency domain analysis:** Introduction, Nyquist criteria for stability, relative stability, GM and PM, stability analysis with Bode plots, Introduction to compensators, lead, lag & lead-lag compensator. (Transfer functions only).	**11**

Course Outcomes:

After completion of course, student will be able to:

1. Understand the concepts of mathematical models of physical systems, transfer functions, stability analysis and compensating networks.
2. Apply the concept of Laplace transformation and RH criteria for stability analysis.
3. Analyze the response of the system for different inputs and stability by RH criteria.
4. Evaluate the stability of the system by frequency domain analysis.

Text Book:

Automatic control systems, Benjamin c kuo, P.H.I publication.9th edition, 2010

Reference Books:

1. Modern control Engineering, K Ogata, P.H.I publication.5th edition, 2010
2. Control Systems Engineering, J Nagrath and M Gopal, New age International, 5th edition, 2008

Syllabus for the Academic Year – 2020 - 2021

Department: Electrical & Electronics Engineering

Semester: IV

Subject Name: FIELDS AND WAVES

Subject Code: PC-18EE404 **L-T-P-C: 3-1-0-4**

Course Objectives:

1. To understand concept of electric and magnetic field.
2. To apply Poisson's and Laplace's equations in various Co-ordinate systems.
3. To analyze Maxwell's equations in static and time varying fields.
4. To evaluate electric and magnetic fields for wave propagation in different mediums.

UNIT	Description	Hours
I	**Electrostatics**: Co-ordinate systems, Gradient, Divergence, Vector Operator, Experimental law of Coulomb's, field due to continuous volume distribution of charge, Electric field intensity, Electric field due to line charge and sheet charge, Electric flux density, Problems, Gauss law, Applications of Gauss law, Divergence theorem. Maxwell's first equation. Relation between electric field & scalar potential.	**11**
II	**Poisson's and Laplace's Equations**: Derivation of Poisson's and Laplace's Equations, Uniqueness theorem, Solution of examples of Laplace's equations in various Co-ordinate systems, Boundary conditions. Energy stored and Energy density in electric field.	**10**
III	**Magneto statics:** Biot-Savart's law, Applications of Biot-Savart's law , Ampere's law, curl, Stokes theorem, magnetic flux and magnetic flux density, Scalar and vector magnetic potential. **Magnetic forces:** Force on moving charge & differential current element. Force on straight current carrying conductor and between two parallel current carrying conductors, Inductance and mutual Inductance.	**11**
IV	**Maxwell's equations and Time varying fields:** Faraday's law of electromagneticinductioninpointandintegralform,Maxwell'sequationsin point and integral form, Displacement current, equation of Continuity, Equivalence of conduction and displacement current, conditions at boundary surface using Maxwell'sequations in electric and magnetic field.	**10**
V	**Uniform Plane wave:** Wave Propagation in free space, Wave Propagation in good conductors and dielectrics, General wave equation in terms of electric field and magnetic field, Poynting theorem, Poynting vector, Skin effect, Relationship between E and H in uniform plane wave.	**10**

Course Outcomes:

After completion of course, student will be able to:

1. Understand concept of electric and magnetic field.
2. Apply Poisson's and Laplace's equations in various Co-ordinate systems.
3. Analyze Maxwell's equations in static and time varying fields.
4. Evaluate electric and magnetic fields for wave propagation in different mediums.

Text Book:

"Engineering Electromagnetics", William K hayt Jr. & John A Buck, 7th edition, TMH publication.

Reference Books:

1. "Electromagnetics with Applications", John Krauss & Daniel A Fleisch, 5th edition, M.G.H publication.
2. "Field & wave Electromagnetics", David K Cheng, 2nd edition, Pearson Education.

Syllabus for the Academic Year – 2020 – 2021

Department: Electrical & Electronics Engineering

Semester: IV

Subject Name: TRANSFORMERS AND INDUCTION MACHINES

Subject Code: PC-18EE405 **L-T-P-C: 3-0-0-3**

Course Objectives:

1. To understand the basic principle of Transformers and Induction Motors
2. To apply testing skills on single phase and three phase transformers.
3. To analyze principle of operation, application and methods of speed control of Induction motors.
4. To evaluation the performance of three phase induction machines after drawing circle diagram.

UNIT	Description	Hours
I	**Single phase transformer:** Introduction to coupled circuits, dot conventions,Principle of operation, Constructional details, EMF equation, Operation of practical transformer under no-load and on load, Open circuit and Short circuit test, Equivalent circuit, Losses, Voltage regulation and its significance.	**08**
II	**Testing of Single-phase Transformer: S**umpner's test, Polarity test, Pre determination of efficiency, All day efficiency. Parallel operation of transformers with necessary conditions.	**07**
III	**Three-phase Transformer: C**onstructional features, Choice between single unit three phase transformer and a bank of three single phase transformers. Transformer connections for three phase operation- star/star, Delta/Delta, star/Delta, Delta /star, V/V connection, and Scott connection for three- phase to two-phase conversion.	**08**
IV	**Three-phase Induction Motor:** Operating principle, Constructional details, different kinds of power losses, efficiency, performance evaluation, output power, torque, current and power factor, Torque-slip characteristics, Equivalent circuit	**08**
V	**Circle Diagram:** No-load and blocked rotor tests. Circle diagram and performance evaluation of the motor. **Starting and Speed Control of Three-phase Induction Motor:** Need for starter. DOL, Star-Delta and auto transformer starting. Rotor resistance starting. **Speed control:** voltage, V/F and rotor resistance.	**08**

Course Outcomes:

After completion of course, student will be able to:

1. Understand the basic principle of Transformers and Induction Motors
2. Apply testing skills on single phase and three phase transformers.
3. Analyze principle of operation, application and methods of speed control of Induction motors.
4. Evaluation the performance of three phase induction machines after drawing circle diagram.

Text Book:

Electrical Machines, I J Nagrath and D P Kothari, T M H, 2nd Edition,, ISBN: 0-07-463285

Reference Books:

1. Electrical Machines and Transformers, Kosco, P H I
2. Electrical Machines, Ashfaq Hussain, Dhanpatrai and Co
3. Performance and Design of A.C. Machines, M.G. Say, C.B.S. Publishers
4. Theory of Alternating Current Machines, Alexander Langsdorf, T M H.

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Syllabus for the Academic Year – 2020 - 2021

Department: Electrical & Electronics Engineering

Semester: IV

Subject Name: ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION

Subject Code: PC-18EE406 **L-T-P-C: 3-0-0-3**

Course Objectives:

1. To understand the concepts of Electrical power transmission and mechanical design of overhead lines.
2. To apply the concept of Underground cables and distribution of Electrical Power
3. To analyze the need of insulators and their importance in transmission and distribution of electrical power.
4. To evaluate the parameters of transmission line R, L, C & G.

UNIT	Description	Hours
I	**Typical transmission and distribution system scheme**: Standard voltages for transmission. Advantages of high voltage transmission. Feeders, Distributors & Service mains **Overhead transmission lines:** Sag calculation in conductors a) Suspended on level supports (b) supports at different levels. Effect of wind and ice. tension and sag at erection. Stringing chart.	**08**
II	**Line parameters**: Calculation of inductance of single phase, three phase lines with equilateral and unsymmetrical spacing. Inductance of composite conductor lines. Calculation of Capacitance for single phase and three phase lines with equilateral and unsymmetrical spacing.	**08**
III	**Characteristics and performance of power transmission lines:** ABCD Constants, short transmission lines, medium transmission lines, Nominal **T** and π representation, long lines, equivalent **T** and π representation of long transmission lines.	**08**
IV	**Insulators:** Types, potential distribution over a string of suspension insulators, String efficiency and methods of increasing string efficiency, testing of insulators. **Corona**: Phenomena, expression for disruptive and visual critical voltages and corona power loss, Paschen's curve (Problems on corona).	**08**
V	**Underground Cables**: Types, materials used, Insulation resistance, charging current, Grading of cables, capacitance grading and inter sheath grading, testing of cables. **Distribution**: Radial and ring main systems, AC to DC distribution: Calculation for concentrated loads.	**07**

Course Outcomes:

After completion of course, student will be able to:

1. Understand the concepts of Electrical power transmission and mechanical design of overhead lines.
2. Apply the concept of Underground cables and distribution of Electrical Power
3. Analyze the need of insulators and their importance in transmission and distribution of electrical power.
4. Evaluate the parameters of transmission line R, L, C & G.

Text Book:

Electrical Power Transmission and Distribution**,** K.L.Ratnakar,New Age International Publication, ISBN No. 978-81-224-3924-3.**2016**

Reference Books:

1. Elements of Power System Analysis, W D Stevenson, MH Publishers. 1982
2. Electric Power Generation Transmission and Distribution, S M Singh, PHI, 2004
3. Transmission & Distribution Handbook, Westing House Corporation, 2000
4. Electrical Power Systems, C L Wadhwa, Wiley Eastern, 1983
5. A Course in Electrical Power, Soni, Gupta & Bhatnagar, Dhanpat Rai and Sons (New Delhi), 2013

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Syllabus for the Academic Year – 2020 - 2021

Department: Electrical & Electronics Engineering

Semester: IV

Subject Name: CONTROL SYSTEMS LABORATORY

Subject Code: PC-18EE407 **L-T-P-C: 0-0-2-1**

Course Objectives:

1. To understand the basic concepts of Servo motors, synchro transmitter pair, Compensation methods, time domain and frequency domain methods
2. To apply the concept of frequency domain analysis for stability studies.
3. To evaluate the performance of servomotors and stability of the system using software package.

SL. NO.	Description
I	Time domain and Frequency domain specifications of a second order system for step input using MATLAB
II	Frequency response of lag, lead and lead-lag compensators.
III	Frequency response of lag, lead and lead-lag compensators using MATLAB
IV	Torque-speed characteristics of DC Servo motor.
V	Performance of a second order system for different damping conditions using MATLAB
VI	Performance characteristics of Synchro transmitter – receiver pair.
VII	Root locus plots using MATLAB
VIII	Torque speed characteristics of AC servo motor
IX	Bode plot using MATLAB
X	Step response of P, PI, PD and PID controller
XI	Step response of P, PI, PD and PID controller using MATLAB
XII	Step response of Second order System.

Course Outcomes:
After completion of course, student will be able to:

1. Understand the basic concepts of Servo motors, synchro transmitter pair, Compensation methods, time domain and frequency domain methods
2. Apply the concept of frequency domain analysis for stability studies.
3. Evaluate the performance of servomotors and stability of the system using software package.

Syllabus for the Academic Year – 2020 - 2021

Department: Electrical & Electronics Engineering

Semester: IV

Subject Name: TRANSFORMERS AND INDUCTION MACHINES LABORATORY

Subject Code: PC-18EE408 **L-T-P-C: 0-0-2-1**

Course Objectives:

1. To understand the basic concepts of Transformers and Induction Machines.
2. To analyze the working of Transformers and Induction Machines .
3. To evaluate the performance of Transformers and Induction machines.

LIST OF EXPERIMENTS

SL. NO.	Description
I	OC and SC test on Single-phase transformer, predetermination of efficiency & regulation.
II	Sumpner's test to find the efficiency of transformers.
III	Parallel operation and load sharing of two dissimilar single phase transformers.
IV	Polarity test & connection of three single phase transformers in star / delta and determination of efficiency & regulation for balanced direct loading for UPF.
V	Scott connection for balanced and unbalanced two phases UPF loads. Connect the given three single transformers in Y/y, Y/d, D/d and find their transformation ratio K.
VI	Three phase induction motor-performance evaluation by Electrical Loading.
VII	Circle diagram of three phase induction motor-performance evaluation and drawing of its equivalent circuit.
VIII	Load Test on single phase induction motor by mechanical loading.
IX	Speed control of three phase induction motor-stator voltage control & rotor resistance control
X	Load test on induction generator

Course Outcomes:

After completion of course, student will be able to:

1. Understand the basic concepts of Transformers and Induction Machines.
2. Analyze the working of Transformers and Induction Machines.
3. Evaluate the performance of Transformers and Induction machines.