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Academic Administration of Techno NJR Institute

Syllabus Deployment

Name of Faculty:Kirti Kurdiya Subject Code:3EX6A

Subject Name: Advanced Engg. Mathematics-1

Department: Department of Electrical Engineering (EE& EEE) SEM: III

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1 : Identify the various methods in Linear algebra, calculus and solid geometry that applies to a given problem

CO 2 : Associate physical problems with above mathematical concepts.

CO 3 : Apply above concepts for solving problems in engineering fields.

CO 4 : Analyze complex problems & categorize it into parts and infer the relation between them.

Lecture No.	Unit	Topic
1	1	**Laplace Transform**: Laplace transform with its simple properties,
2	1	Applications to the solution of ordinary and
3	1	Partial differential equations having constant coefficients
4	1	Partial differential equations having constant coefficients
5	1	With special reference to wave and
6	1	Diffusion equations
7	1	Diffusion equations

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8	1	Digital transforms
9	**2**	**Fourier Transform**: Discrete Fourier transform,
10	2	Fast Fourier transform, Complex
11	2	Form of Fourier transform and
12	2	Its inverse applications
13	2	Fourier transform for the solution of partial differential equations having constant
14	2	Fourier transform for the solution of partial differential equations having constant
15	2	Coefficients with special reference to heat equation and wave equation.
16	2	Coefficients with special reference to heat equation and wave equation.
17	**3**	**Fourier Series**: Expansion of simple functions in Fourier series,
18	3	Half range series,
19	3	Change of interval,
20	3	Harmonic analysis.
21	3	Calculus of Variation: Functional,
22	3	Strong and weak variations,
23	3	Simple variation
24	3	Problems, Euler's equation
25	**4**	**Complex Variables**:
26	4	Analytic functions,
27	4	Cauchy–Riemann equations,
28	4	Elementary
29	4	Conformal mapping with simple applications
30	4	Line integral in complex domain,
31	4	Cauchy's theorem,
32	4	Cauchy's integral formula.
33	**5**	**Complex Variables**:
34	5	Taylor's series,
35	5	Laurent's series,
36	5	Poles,
37	5	Residues.
38	5	Evaluations of simple definite real integrals using the theorem of

		residues.
39	5	Simple contour
40	5	Integration

TEXT/REFERENCE BOOKS

1 M. Ray, J. C. Chaturvedi & H.C. Sharma, Differential Equations, Students friends & company

2 Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya

3 Bird, Higher Engineering Mathematics, ELSEVIER. 2004

4 Jeffrey, Advanced Engineering Mathematics, ELSEVIER.

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Syllabus Deployment

Name of Faculty: Pankaj Ameta Subject Code:3EX4A
Subject Name: Object Oriented Prog.

Department: Department of Electrical Engineering (EE& EEE) SEM: III
Total No of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:
CO 1 :Describe the basic concepts of programming
CO 2 : 1. Describe the basic concepts of programming
CO 3 : Describe & apply the concepts of functions
CO 4 : Design, implement debug & document a program for a given problem statement

Lecture No.	Unit	Topic
1	**1**	**Introduction:**
2	1	Review of structures in C,
3	1	Accessing members of structures using
4	1	Structure variables,
5	1	Pointer to structures,
6	1	Passing structures to functions
7	1	Passing structures to functions
8	1	Structures as user defined data types.
9	**2**	**Introduction to Programming Paradigms:** (Process oriented and Object oriented). Concept of object, class, objects as variables of class data type, difference in

10	2	Structures and class in terms of access to members, private and public Basics of C++: Structure of C++ programs, introduction to defining member functions within and
11	2	Outside a class, keyword using, declaring class, creating objects, constructors & destructor functions, Initializing member values with and without use of
12	2	Constructors, simple programs to access & manipulate data members, cin and cout functions. Dangers of returning reference to a private data member, constant objects and
13	2	Members function, composition of classes, friend functions and classes, using this
14	2	Pointer, creating and destroying objects dynamically using new and delete operators.
15	2	Static class members, container classes and iterators, proxy classes. Members of a
16	2	Class, data & function members. Characteristics of OOP- Data hiding, Encapsulation, data security.
17	**3**	**Operator Overloading**:
18	3	Fundamentals, Restrictions,
19	3	Operator functions as class
20	3	Members v/s as friend functions.
21	3	Overloading stream function,
22	3	Binary operators and
23	3	Unary operators.Converting
24	3	Between types.
25	**4**	**Inheritance**: Base classes and derived classes,
26	4	Protected members, relationship
27	4	Between base class and derived classes,
28	4	Constructors and destructors in derived
29	4	Classes, public, private and protected inheritance
30	4	Relationship among objects in an inheritance hierarchy,
31	4	Abstract classes, virtual
32	4	Functions and dynamic binding, virtual destructors.
33	**5**	**Multiple inheritance**,
34	5	Virtual base classes,

35	5	Pointers to classes and
36	5	Class members,
37	5	Class members
38	5	Multiple class members.
39	5	Templates,
40	5	Exception handling.

TEXT/REFERENCE BOOKS

1 Dietel, How to Program C++, Pearson 2013

2 K. R. Venugopal, Mastering C++, TMH

3 Robert Lafore, Object Oriented Programming in C++, Pearson 2001

4 Rambaugh, Object Oriented Design & Modelling, Pearson

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Syllabus Deployment

Name of Faculty: Ashika Sharma Subject Code:3EX2A

Subject Name: Circuit Analysis & Synthesis

Department: Department of Electrical Engineering (EE& EEE) SEM: III

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO1 apply different techniques for analysis of electrical circuit.

CO2 explain transient response of different circuits using Laplace transform.

CO3 Analyses magnetically coupled circuits.

CO4 apply graph theory to formula network equations.

CO5 compute Fourier series for complex waveforms.

Lecture No.	Unit	Topic
1	1	**Network Theorems** and Elements:Thevenin's, Norton's, Reciprocity, Superposition,
2	1	Compensation, Miller's,
3	1	Tellegen's and maximum power transfer theorems.
4	1	Networks with dependent sources.Inductively coupled circuits – mutual inductance,
5	1	Coefficient of coupling and mutual inductance between portions of same circuits and
6	1	Between parallel branches. Transformer equivalent,
7	1	Inductively and conductively
8	1	Coupled circuits

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9	**2**	**Transients Analysis**: Impulse, step,
10	2	Ramp and sinusoidal response analysis of first
11	2	Order and second order circuits.
12	2	Time domain & transform domain (frequency,
13	2	Laplace) analysis.
14	2	Initial and final value theorems.Complex periodic waves and
15	2	Their analysis by Fourier
16	2	Analysis.Different kind of symmetry.Power in a circuit.
17	**3**	**Network Functions**: Terminals and terminal pairs,
18	3	Driving point impedance transfer
19	3	Functions. Poles and zeros.Restrictions on pole and zero location in s-plane.
20	3	Time domain behavior from pole and zero plot.
21	3	Procedure for finding network
22	3	Functions for general two terminal pair networks.
23	3	Stability & causality.Hurwitz
24	3	Polynomial, positive real function.
25	**4**	**Two Port Networks**: Two Port General Networks:
26	4	Two port parameters (impedance,
27	4	Admittance, hybrid, ABCD and S parameters) and their inter relations.
28	4	Equivalence of two ports. Transformer equivalent,
29	4	Interconnection of two port
30	4	Networks. The ladder network, image impedance,
31	4	image transfer function, application
32	4	L-C network, attenuation and phase shift in symmetrical T and pi networks.
33	**5**	**Network Synthesis**:
34	5	The four-reactance function forms,
35	5	Specification for reactance
36	5	Function. Foster form of reactance networks.
37	5	Cauer form of reactance networks Synthesis of
38	5	R-L and R-C and
39	5	L-C networks in
40	5	Foster and Cauer forms

TEXT/REFERENCE BOOKS

1.Van Valkenburg, Network Analysis, PHI 2013

2 Hayt & Kemmerly, Engineeirng Circuit Analysis, 6/e (TMH) 2012

3 J. Edminster & M. Nahvi, Electric Circuits (SIE), 5/e, Scaum's Out Line. 2013

4 Nagsarkar & Sukhija, Circuits & Networks, Oxford

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Syllabus Deployment

Name of Faculty: Vivek Jain Subject Code:3EX3A

Subject Name: Digital Electronics

Department: Department of Electrical Engineering (EE& EEE) SEM: III

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1 : Understand the basic logic gates and various variable reduction techniques of digital logic circuit in detail.

CO 2 : Understand, identify and design combinational and sequential circuits

CO 3 : Design and implement hardware circuit to test performance and application for what it is being designed.

Lecture No.	Unit	Topic
1	**1**	**Number Systems**, Basic Logic Gates & Boolean Algebra: Binary Arithmetic &
2	1	Radix representation of different numbers. Sign & magnitude representation, Fixed
3	1	Point representation, complement notation, various codes & arithmetic in different
4	1	Codes & their inter conversion.Features of logic algebra, postulates of Boolean algebra.Theorems of Boolean
5	1	Algebra.Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates,

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6	1	Their block diagrams and truth tables. Logic diagrams from Boolean expressions and
7	1	Vica-versa. Converting logic diagrams to universal logic. Positive, negative and
8	1	Mixed logic.Logic gate conversion.
9	**2**	**Digital Logic Gate Characteristics**:
10	2	TTL logic gate characteristics: Theory &
11	2	Operation of TTL NAND gate circuitry.
12	2	Open collector TTL.
13	2	Three state output logic.
14	2	TTL subfamilies.MOS & CMOS logic families.
15	2	Realization of logic gates in RTL,
16	2	DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another.
17	**3**	**Minimization Techniques**: Minterm,
18	3	Maxterm, Karnaugh Map,
19	3	K map upto variables.
20	3	Simplification of logic functions with K-map
21	3	Conversion of truth tables in POS and
22	3	SOP form. Incomplete specified functions.
23	3	Variable mapping.
24	3	Quinn-McKlusky minimization techniques.
25	**4**	**Combinational Systems**: Combinational logic circuit design, half and full adder,
26	4	subtractor. Binary serial and parallel adders.
27	4	BCD adder.Binary multiplier. Decoder:
28	4	Binary to Graydecoder, BCD to decimal,
29	4	BCD to 7-segment decoder.
30	4	Multiplexer, demultiplexer,encoder.Octal to binary, BCD to excess-3 encoder.Diode
31	4	Switching matrix.Design of logic circuits by multiplexers, encoders, decoders and

32	4	Demultiplexers.
33	**5**	**Sequential Systems**: Latches,
34	5	flip-flops, R-S, D, J-K, Master Slave flip flops.
35	5	Conversions of flip-flops.
36	5	Counters: Synchronous & asynchronous ripple and decade counters, Modulus
37	5	Counter, skipping state counter, counter design,
38	5	State diagrams and state reduction
39	5	Techniques. Ring counter. Counter applications.
40	5	Registers: buffer register, shift register.

TEXT/REFERENCE BOOKS

1 Herbert Taub, Donald L. Schilling, Digital Integrated Electronics, TMH 2008

2 M. Morris Mano, Digital Logic and Computer Design, Pearson Edu.

3 Millman Taub, Pulse Switching and Network, TMH 2009

4 A. Anandkumar, Fundamentals of Digital circuits, PHI

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Syllabus Deployment

Name of Faculty: Yashwant Soni Subject Code:3EX1A

Subject Name: Electronic Devices & Circuits

Department: Department of Electrical Engineering (EE& EEE) SEM: III

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1. Understand and apply basic and semiconductor principles to the device tc observe its performance.

CO 2. Comply and verify parameters after exciting devices by any stated method.

CO 3. Simulate electronics circuits using computer simulation software to obtain desired results.

CO 4. Understand and verify simulated circuit with hardware implementation.

CO 5. Implement hardwired circuit to test performance and application for what it is being designed.

CO 6. Analyze and model BJT and MOSFET for small signal.

Lecture No.	Unit	Topic
1	1	**Semiconductor Physics**: Mobility and conductivity,
2	1	Charge densities in a
3	1	Semiconductor, Fermi Dirac distribution,
4	1	Fermi-Dirac statistics and Boltzmann
5	1	Approximation to the Fermi-Dirac statistics, carrier concentrations and Fermi levels in
6	1	Semiconductor. Generation and recombination of charges,

7	1	Diffusion and continuity equation, transport
8	1	Equations, Mass action Law, Hall effect.
9	**2**	**Junction Diodes**: Formation of homogenous and hetrojuntion diodes and their energy
10	2	Band diagrams, calculation of contact potential and depletion width, V-I
11	2	Characteristics, Small signal models of diode, Diode as a circuit element, diode
12	2	Parameters and load line concept, C-V characteristics and dopant profile.
13	2	Applications of diodes in rectifier, clipping, clamping circuits and voltage
14	2	Multipliers.Transient behavior of PN diode.Breakdown diodes, Schottky diodes, and
15	2	Zener diode as voltage regulator.Construction,
16	2	Characteristics and operating principleof UJT.
17	**3**	**Transistors: Characteristics**, Current Components, Current Gains: alpha and beta.
18	3	Variation of transistor parameter with temperature and current level, Operating point,
19	3	Hybrid model, DC model of transistor,
20	3	H-parameter equivalent circuits.CE, CB and CC
21	3	Configuration DC and AC analysis of single stage CE,
22	3	CC (Emitter follower) and CB amplifiers AC
23	3	& DC load line, Ebers-Moll model.Biasing & stabilization techniques.Thermal
24	3	runaway, Thermal stability.
25	**4**	**JFET & MOSFET**:Construction and operationofJFET &
26	4	MOSFET, noise performances of FET,
27	4	Parasitic of MOSFET,
28	4	Small signal models of JFET & MOSFET
29	4	Biasing of JFET's & MOSFET's. Low frequency single stage CS and CD (source
30	4	Follower JFET amplifiers.
31	4	FET as voltage variable resistor and

32	4	Active load.
33	**5**	**Small Signal Amplifiers at Low Frequency**: Analysis of BJT and FET multistage
34	5	Amplifier, DC and RC coupled amplifiers.
35	5	Frequency response of single and multistage
36	5	Amplifier, mid-band gain, gains at low and high frequency.
37	5	Analysis of DC and differential amplifiers,
38	5	Miller's Theorem, use of Miller and
39	5	Bootstrap configuration. Cascade and cascade configuration of multistage amplifiers
40	5	(CE-CE, CE-CB, CS-CS and CS-CD), Darlington pair.

TEXT/REFERENCE BOOKS

1 Millman Halkias, Integrated Electronics, TMH 2011

2 R. L. Boylestad, Louis Nashelsky, Electronic devices & circuits theory, Pearson Education

3 David Bell, Electronic Devices & Circuits, Oxford Publications 2009

4 Schultz, Grob's, Basic Electronics, TMH

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Syllabus Deployment

Name of Faculty: Amrit Lal Subject Code:3EX5A

Subject Name: Electrical Machine -I

Department: Department of Electrical Engineering (EE& EEE) SEM: III

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to

CO1: Explain the construction, working principle, performance and applications of Poly-phase induction machine, Single phase motors, synchronous generator (Alternator) and synchronous motor.

CO2: Identify, formulate and solve the numerical problems related to above machines.

CO3: Analyze the performance characteristics for different electrical machines and obtain simple equivalent circuit for the machine.

CO4:Explain different testing and starting methods for electrical machines so as to identify their applicability in different practical situations.

CO5: Evaluate the purpose for parallel operation of synchronous generators and learn the conditions to be satisfied for this.

Lecture No.	Unit	Topic
1	1	(Magnetic circuits:Magnetic circuits, magneto motive force magnetic field
2	1	Strength, permeability, reluctance,
3	1	Analogy between electric and magnetic-circuits, B-H
4	1	Curve, hysteresis, series and parallel magnetic circuits, practical

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		magnetic circuits,
5	1	Permanent magnet and their applications.
6	1	Electromechanical energy conversion: Basic principles, conservation of energy,
7	1	Physical phenomenon involved in conversion, energy balance, energy stored in
8	1	Magnetic field.
9	**2**	DC Generators: Introduction, construction, types, emf equation, lap and wave
10	2	Windings, armature reaction,
11	2	Commutation, methods of improving commutation,
12	2	Equalizer rings
13	2	Demagnetizing and cross magnetizing ampere turns,
14	2	Various characteristics of shunt,
15	2	Series and compound generators, voltage build up, losses and efficiency, condition for
16	2	Maximum efficiency.
17	**3**	DC Motors: Introduction, principals,
18	3	Back-emf, torque of motor, types, characteristics
19	3	Shunt, series and compound motors,
20	3	Speed control (field and armature control
21	3	Methods, basic idea of solid state devices in controlling of DC motors
22	3	Starting of DC motors, three point and four point starters, losses and efficiency, testing
23	3	Brake test and swimburnes test
24	3	Electric braking of DC motors, Applications.
25	**4**	Transformer: Construction, Principal,
26	4	Types, emf equation, no load and short circuit
27	4	Test, equivalent circuits, back-to-back (Sumpner's test), phasor diagram,
28	4	Voltage regulation
29	4	Efficiency, Condition for maximum efficiency, all day efficiency,
30	4	Parallel operation ,

31	4	Auto-transformer, basic idea of welding transformer, current and potential
32	4	transformer, separation of losses.
33	**5**	Polyphase Transformer: Construction, Various connections and groups, choice of
34	5	Connections, open delta connection,
35	5	Scott connection, three phase to two phase
36	5	Conversion and vice-versa, Applications, Parallel operation and its conditions
37	5	Three to six phase conversion.
38	5	Excitation phenomenon in transformers, magnetizing
39	5	Harmonic currents and their effects, switching currents in transformers, inrush of
40	5	Magnetizing current. Three winding transformer

TEXT/REFERENCE BOOKS

1 A. E. Fitzgerald, C. Kingsley Jr and Umans, Electric Machinery, 6th Edition McGraw Hill, International Student Edition.
2 Kothari & Nagrath, Electric Machines, 3/e, TMH
3 M. G. Say, The Performance and Design of AC machines, Pit man & Sons.
4 Guru, Electric Machinery, 3e, Oxford 2000
5 R. K. Srivastava, Electrical Machines, Cengage Learning.

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Lab Deployment

Name of Faculty: Dr. Vivek Jain	Subject Code: 3EX9A
Subject Name: Digital Electronics Lab	SEM: III
Department: Department of Electrical & Electronics Engineering	
Total No. of Labs Planned: 10	

COURSE OUTCOMES

Atthe end of this course students will be able to:

CO1: Verify the functionality of TTL ICs & understand the respective datasheet.

CO2: Design combinational logic circuits using TTL ICs.

Labs No.	Name of Experiment
1	To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify the truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gates with 2, 3, & 4 inputs).
2	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates.
3	To realize an SOP and POS expression.
4	To realize Half adder/ Subtractor& Full Adder/ Subtractor using NAND &

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	NOR gates and to verify their truth tables.
5	To realize a 4-bit ripple adder/ Subtractor using basic Half adder/ Subtractor & basic Full Adder/ Subtractor.
6	To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.
7	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 sevensegment display.
8	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9	Construct a divide by 2, 4 & 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10	Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer.

TEXT/REFERENCE BOOKS

1. Modern Digital Electronics, R.P Jain, Tata McGraw-Hill Education
2. Digital Circuit & Logic Design, Morris Mano, Prentice Hall of India
3. Digital Principles & Applications, A.P. Malvino& D.P Leach, Tata McGraw-Hill Education

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Syllabus Deployment

Name of Faculty: Yashwant soni Subject Code: 3EX7A
Subject Name: EDC Lab

Department: Department of Electrical Engineering (EE& EEE) SEM: III
Total No of Lab Planned: 11

Lab OUTCOMES

At the end of this course students will be able to:

. CO1 Understand the characteristics of different Electronic Devices.

CO2 Verify the rectifier circuits using diodes and implement them using hardware.

CO3 Design various amplifiers like CE, CC, common source amplifiers and implement them using hardware and also observe their frequency responses

CO4 Understand the construction, operation and characteristics of JFET and MOSFET, which can be used in the design of amplifiers.

CO5 Understand the need and requirements to obtain frequency response from a transistor so that Design of RF amplifiers and other high frequency amplifiers is feasible

Lab No.	Practical No.	Topic
1	1	Study the following devices: (a) Analog & digital multimeters (b) Function/ Signal generators (c) Regulated d. c. power supplies (constant voltage and constant current operations) (d) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures
2	2	2. Plot V-I characteristic of P-N junction diode & calculate

		cut-in voltage, reverse saturation current and static & dynamic resistances.
3	3	3. Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
4	4	4. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
5	5	5. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss&Vp.
6	6	6. Application of Diode as clipper & clamper.
7	7	7. Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth andcompare it with theoretical value.
8	8	8. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
9	9	9. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
10	10	10. Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.
11	11	11. Study bridge rectifier and measure the effect of filter network on DC voltage output and ripple factor.

TEXT/REFERENCE BOOKS

1 Electronic devices & circuits theory, R.L. Boylestad, Louis Nashelsky , Pearson education
2 Electronic devices & circuits, David Bell, Oxford Publications
3 M Rashid – Microelectronic circuits : Analysis & Design, Cengage learning
4 Millman, Electronics Devices and Circuits, TMH
5 Electronic Devices,7e, Floyd, Pearson
6 A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing

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Syllabus Deployment

Name of Faculty: Mr. C P Jain Subject Code: 3EX11A
Subject Name: HUMANITIES & SOCIAL SCIENCE

Department: Department of Electrical Engineering (EE& EEE) SEM: III
Total No of Lab Planned: 10

Lab OUTCOMES
At the end of this course students will be able to:
CO: Students able to explain the Brief history of Indian Constitution, The Fundamentals of Economics, Microeconomics: Law of demand supply and Macroeconomics: concepts relating to National product–National income and its measurement

Lab No.	Practical No.	Topic
1	1	India: Brief history of Indian Constitution, farming features, fundamental rights
2	1	India: duties, directive principles of state. History of Indian National Movement, socio economic growth after independence
3	2	Society: Social groups- concept and types, socialization- concept and theory
4	2	Society: social control: concept, social problem in contemporary India, status and role.
5	3	The Fundamentals of Economics: meaning, definition and importance of economics, Logic of choice
6	3	The Fundamentals of Economics: central economic problems, positive and normative approaches, economic systems-socialism and capitalism.
7	4	Microeconomics: Law of demand supply, utility approach, indifference curves
8	4	Microeconomics: elasticity of demand and supply and applications, consumer surplus, Law of returns to factors and returns to scale
9	5	Macroeconomics: concepts relating to National product–National income and its measurement, Simple Keynesian theory, simple multiplier, money and banking

10	5	Macroeconomics: Meaning, concept of international trade, determination of exchange rate, Balance of payments.

TEXT/REFERENCE BOOKS

1. Humanities And Social Science Book by Prof. Madhavi Pradhan, Prof. Nitin Shekapure, and Prof. Swapnaja Hiray

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Syllabus Deployment

Name of Faculty: Mr. RajkumarSoni Subject Code: 3EX8A

Subject Name: Electrical Circuit Design Lab SEM: III

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 16

Lab OUTCOMES

At the end of this course students will be able to:

CO1 Practically verify theorems for AC and DC circuit.
CO2 PSpice programs for DC and AC analysis and transient analysis of RC and RL circuit.
CO3 Hendon Conversion Y-connected resister to Delta connected circuit.
CO4 Obtained voltageand current vs frequency graph for resonant circuit.
CO5 To learn to program calculate the resistance of conductor.

Lab No.	Topic
1	Introduction to Datasheet Reading.
2	Introduction to Soldering De-soldering process and tools.
3	Simulate characteristic of BJT and UJT. Validate on Bread Board o PCB.
4	Simulate Bridge Rectifier Circuit and validate on Bread Board or PCE a) Half Bridge.

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5	Simulate Bridge Rectifier Circuit and validate on Bread Board or PCB. b) Full Bridge.
6	Simulate Regulated Power Supply and validate on Bread Board or PCB. a) Positive Regulation (03 Volt to 15 Volt).
7	Simulate Regulated Power Supply and validate on Bread Board or PCB. b) Negative Regulation (03 Volt to 15 Volt).
8	Simulate Regulated Power Supply and validate on Bread Board or PCB. c) 25 Volt, 1–10 A Power Supply.
9	Simulate Multi-vibrator circuit using IC 555 and BJT separately. Validate on Bread Board or PCB. a) Astable Mode.
10	Simulate Multi-vibrator circuit using IC 555 and BJT separately. Validate on Bread Board or PCB. b) Bi-stable Mode.
11	Simulate Multi-vibrator circuit using IC 555 and BJT separately. Validate on Bread Board or PCB. c) Mono-stable Mode.
12	Introduction to Sensors to measure real time quantities and their implementation in different processes. Proximity, Accelerometer, Pressure, Photo-detector, Ultrasonic Transducer
13	Introduction to Sensors to measure real time quantities and their implementation in different processes. Smoke, Temperature, IR, Color, Humidity, etc.Transducer
14	Hardware implementation of temperature control circuit using Thermistor.
15	Simulate Buck, Boost, and Buck-Boost circuit and validate on Bread Board or PCB.
16	Simulate Battery Voltage Level Indicator Circuit and validate on Bread Board or PCB.

TEXT/REFERENCE BOOKS

1 Circuits And Networks: Analysis And Synthesis, Sudhakar, TMH 2006

2 Sivanagaraju – Electrical circuit analysis, Cengage learning 2009

3	Robbins – Circuit analysis : Theory and Practice, Cengage Learning	2012
4	Electrical Networks, Singh, TMH	2009

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Syllabus Deployment

Name of Faculty: Pankaj Ameta Subject Code: 3EX10A
Subject Name: C++ PROGRAMMING LAB

Department: Department of Electrical Engineering (EE& EEE) SEM: III
Total No of Lab Planned: 08

Lab OUTCOMES

At the end of this course students will be able to:
CO1. C++ program structure without any CLASS declaration.
CO2. Demonstration Friend function friend classes and this pointer.
CO3. Demonstration dynamic memory management using new & delete & static class members
CO4. Demonstration of restrictions an operator overloading, operator functions as member function and/ or friend function.

Lab No.	Practical No.	Topic
1	1	To write a simple program for understanding of C++ program structure without any CLASS declaration. Program may be based on simple input output, understanding of keyword using.
2	2	Write a C++ program to demonstrate concept of declaration of class with public & private member, constructors, object creation using constructors, access restrictions, defining member functions within and outside a class. Scope resolution operators, accessing an object's data members and functions through different type of object handle name of object,

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		reference to object, pointer to object, assigning class objects to each other.
3	3	Program involving multiple classes (without inheritance) to accomplish a task. Demonstrate composition of class.
4	4	Demonstration Friend function friend classes and this pointer.
5	5	Demonstration dynamic memory management using new & delete & static class members.
6	6	Demonstration of restrictions an operator overloading, operator functions as member function and/ or friend function, overloading stream insertion and stream extraction, operators, overloading operators etc.
7	7	Demonstrator use of protected members, public & private protected classes, multi-level inheritance etc.
8	8	Demonstrating multiple inheritance, virtual functions, virtual base classes, abstract classes

TEXT/REFERENCE BOOKS

1. Dietel, How to Program C++, Pearson
2. K. R. Venugopal, Mastering C++, TMH

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Syllabus Deployment

Name of Faculty: Tanu Subject Code:4EX4A

Subject Name: Electrical Engineering Materials

Department: Department of Electrical Engineering (EE& EEE) SEM: IV

Total No of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1: Understand the electrical properties and characteristics of various materials, used in the electrical appliances, devices and instruments.

CO2: Understand the atomic structure and interatomic bondings.

CO3: Analyze the property and characteristics of dielectric, magnetic, conducting and semiconducting materials.

Lecture No.	Unit	Topic
1	**1**	**Dielectric Materials**:
2	1	Polarization phenomenon,
3	1	Spontaneous polarization,
4	1	Spontaneous polarization,
5	1	Dielectric constant and loss,
6	1	Dielectric constant and loss,
7	1	Piezo and
8	1	Ferro electricity application.
9	**2**	**Magnetic Materials**:
10	2	Dia,
11	2	Para,

12	2	Ferro- ferrimagnetisms;
13	2	Soft and
14	2	Hard magnetic
15	2	Materials and
16	2	Their applications.
17	**3**	**Semi-Conductor Materials**:
18	3	Crystal growth, zone refining, Degenerate and no
19	3	Degenerate semiconductors,
20	3	Direct and indirect band gap semiconductors.
21	3	Electronic properties of silicon,
22	3	Germanium, Compound Semiconductor, Gallium Arsenide,
23	3	Gallium phosphide &
24	3	Silicon carbide.
25	**4**	**Conductive & Superconductive Materials**:
26	4	Electrical properties of conductive
27	4	Resistive materials. Important characteristics and
28	4	Electronic applications of specific conductor & resistance materials.
29	4	Superconductor phenomenon,
30	4	Type I and
31	4	Type II superconductors and their
32	4	Applications.
33	**5**	**Passive Components** &PCB Fabrication: Brief study of fabrication methods of
34	5	Fixed and variable type of resistors;
35	5	Capacitors, Inductors, solenoid and toroid, air
36	5	Core, iron core and Ferro core conductors.
37	5	Printed Circuit Boards -
38	5	Types, Manufacturing of copper clad laminates, PCB
39	5	Manufacturing process, Manufacturing of single and double sided PCBs.
40	5	Surface mount devices - advantages & limitations

TEXT/REFERENCE BOOKS

1. S. O. Kasap, "Principle of Electrical Engineering materials and devices" ,

3/e, TMH
2 B. D. Indu, "Electrical Engineering Materials", Jain Brothers.

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Syllabus Deployment

Name of Faculty: Ashika Sharma Subject Code:4EX3A

Subject Name: Electrical Measurements

Department: Department of Electrical Engineering (EE& EEE) SEM: IV

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to

CO1: Analyze the mechanism of torque production and operation of permanent magnet and electro-magnetic measuring instruments.

CO2: Understand the working of potentiometer and different DC and AC bridges for accurate measurement of electrical quantities.

CO3: Determine the magnitude of electrical quantities like resistance, inductance, capacitance, power, energy etc. over wide range of magnitude.

CO4:Explain the working principle of Current transformer and Potential transformer and also can define the ratio error and phase angle error.

Lecture No.	Unit	Topic
1	1	**Measuring Instruments**: Moving coil, moving iron, electrodynamic and induction
2	1	Instruments-construction, operation, torque equation and errors. Applications of
3	1	Instruments for measurement of current,
4	1	Voltage, single-phase power and singlephase

5	1	Energy.
6	1	Errors in wattmeter and energy meter and
7	1	Their compensation and adjustment.
8	1	Testing and calibration of single-phase energy meter by phantom loading.
9	**2**	**Polyphase Metering**: Blondel's Theorem for n-phase, p-wire system. Measurement
10	2	Power and reactive kVA in 3-phase balanced and unbalanced systems: Onewattmeter,
11	2	Two-wattmeter and three-wattmeter methods. 3-phase induction type
12	2	Energy meter. Instrument Transformers: Construction and operation of current and
13	2	Potential transformers.
14	2	Ratio and phase angle errors and their minimization. Effect of variation of power
15	2	Factor, secondary burden and frequency on errors. Testing of CTs and PTs.
16	2	Applications of CTs and PTs for the measurement of current, voltage, power and energy.
17	**3**	**Potentiometers: Construction,**
18	3	Operation and standardization of DC
19	3	Potentiometers– slide wire and Crompton potentiometers. Use of potentiometer for
20	3	Measurement of resistance and voltmeter and
21	3	Ammeter calibrations.
22	3	Volt ratio boxes. Construction, operation and
23	3	Standardization of AC potentiometer in-phase and
24	3	Quadrature potentiometers. Applications of AC potentiometers.
25	**4**	**Measurement of Resistances**: Classification of resistance. Measurement of
26	4	Medium resistances – ammeter and
27	4	Voltmeter method, substitution method,
28	4	Wheatstone bridge method.
29	4	Measurement of low resistances

30	4	Potentiometer method and Kelvin's double
31	4	Bridge method. Measurement of high resistance: Price's Guard-wire method.
32	4	Measurement of earth resistance.
33	**5**	**AC Bridges**: Generalized treatment of four-arm AC bridges. Sources and
34	5	Detectors. Maxwell's bridge,
35	5	Hay's bridge and Anderson bridge for self-inductance
36	5	Measurement. Heaviside's bridge for mutual inductance measurement. De Sauty
37	5	Bridge for capacitance measurement.
38	5	Wien's bridge for capacitance and frequency measurements. Sources of error in
39	5	Bridge measurements and precautions. Screening of bridge components.
40	5	Wagner earth device.

TEXT/REFERENCE BOOKS

1 H. S. Kalsi, Electronic Inst. & Measurement, TMH 2004
2 Morris, Electrical Measurements & Instrumentation, ELSEVIER
3 Bell, Electronic Instrumentation And Measurement, Oxford 1994
4 W. D. Cooper, Electronic Inst. & Measurement Techniques, Prentice Hall, India.

Techno India NJR Institute of Technology

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Syllabus Deployment

Name of Faculty: Amrit Lal Subject Code:4EX5A

Subject Name: Electrical machine - II

Department: Department of Electrical Engineering (EE& EEE) SEM: IV

Total No of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1: Explain the construction, working principle, performance and applications of Poly-phase induction machine, Single phase motors, synchronous generator (Alternator) and synchronous motor.

CO2: Identify, formulate and solve the numerical problems related to above machines.

CO3: Analyze the performance characteristics for different electrical machines and obtain simple equivalent circuit for the machine.

CO4: Explain different testing and starting methods for electrical machines so as to identify their applicability in different practical situations.

CO5: Evaluate the purpose for parallel operation of synchronous generators and learn the conditions to be satisfied for this.

Lecture No.	Unit	Topic
1	1	**AC Machines Fundamentals**: Introduction,
2	1	Emf equation, mmf of three phase AC
3	1	Winding, production of rotating magnetic field,
4	1	Types of AC windings

5	1	Concentric, distributed and chorded windings,
6	1	Pitch factor, distribution factor,
7	1	Effect of these factors on induced emf,
8	1	Effect of harmonics.
9	**2**	**Polyphase Induction Motor**: Introduction. Construction, cage and wound rotors,
10	2	Principal, starting and running torque,
11	2	Condition for maximum torque, equivalent
12	2	Circuits, no load and block rotor test.
13	2	Torque-slip characteristics,
14	2	Losses and efficiency, circle diagram, starting of cage
15	2	Wound motors, speed control, cogging and crawling, double cage rotor,
16	2	Induction generator, application.
17	**3**	**Single Phase Induction Motor**: Introduction,
18	3	Construction, principal, double
19	3	Revolving field theory, equivalent circuit,
20	3	Performance calculations, starting
21	3	Methods, and their types, torque slip characteristics of various types.
22	3	Special Machines: Single phase synchronous motor, series motor, universal
23	3	Motor, Stepper motors variable reluctance,
24	3	Permanent magnet and hybrid stepper motors.
25	**4**	**Synchronous Generators** (Alternators): Introduction, Construction, advantages
26	4	Rotating field, types of rotors, emf equation, excitation systems, equivalent
27	4	Circuit and their phasor diagrams, voltage regulation, synchronous impedance
28	4	Method, mmf method.
29	4	Zero power factor method, two reaction theory of salient pole rotor, phasor
30	4	Diagram, power developed and power angle characteristics of salient pole machine,

31	4	Determination of Xd and Xq, synchronization, synchronizing power and torque,
32	4	Parallel operation application.
33	**5**	**Synchronous Motors**: Introduction, construction, principal of operation,
34	5	Starting of synchronous motor,
35	5	Equivalent circuit and phasor diagrams, power and torque,
36	5	Performance calculation, speed torque characteristics, power factor control-effect
37	5	Change of excitation.
38	5	V curve and inverted V curve, synchronous condenser and reactors, synchronous
39	5	Phase modifiers, hunting-causes and remedies, applications, synchronous induction
40	5	Motor application.

Text Book/Reference Book:

1 A. E. Fitzgerald, C. KingsleyJr and Umans, Electric Machinery, 6th Edition McGraw Hill, International Student Edition.
2 Kothari & Nagrath, Electric Machines 3/e,TMH
3 M. G. Say, The Performance and Design of AC machines, Pit man & Sons.
4 Guru, Electric Machinery 3e, Oxford

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Syllabus Deployment

Name of Faculty: Yashwant soni Subject Code:4EX2A
Subject Name: Linear Integrated Circuit

Department: Department of Electrical Engineering (EE& EEE) SEM: IV
Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1. Understand the characteristics of IC and Op-Amp and identify the internal structure.

CO 2. Understand and identify various manufacturing techniques

CO3 . Derive and determine various performances based parameters and their significance for Op-Amp

CO 4. Comply and verify parameters after exciting IC by any stated method.

CO 5. Analyze and identify the closed loop stability considerations and I/C limitations.

Lecture No.	Unit	Topic
1	**1**	**Operational Amplifiers:**
2	1	Basic differential amplifier analysis,
3	1	Single ended and double
4	1	Ended configurations,
5	1	Op-amp configurations with feedback.
6	1	Op-amp parameters,

7	1	Inverting and Non-Inverting configuration,
8	1	Comparators, Adder.
9	**2**	**Operational Amplifier Applications**:
10	2	Integrator, Differentiator, Voltage to
11	2	Frequency & Frequency to voltage converters.
12	2	Oscillators: Phase shift,
13	2	Wien Bridge,
14	2	Quadrature, square wave,
15	2	Triangular wave, saw
16	2	Tooth oscillators. Voltage controlled oscillators.
17	**3**	**Active Filters:**
18	3	Low pass,
19	3	High pass, band pass and
20	3	Band reject filters,
21	3	All pass filter.
22	3	Switched capacitor filter,
23	3	Butterworth filter design,
24	3	Chebyshev Filter design.
25	**4**	**Phase-Locked Loops**:
26	4	Operating Principles of PLL,
27	4	Linear Model of PLL, Lock range,
28	4	Capture range, Applications of PLL as FM detector,
29	4	FSK demodulator.
30	4	AM detector, Frequency translator, phase shifter,
31	4	Tracking filter, signal
32	4	Synchronizer and frequency synthesizer, Building blocks of PLL, LM565 PLL.
33	**5**	**Linear IC's: Four quadrant multiplier & its applications,**
34	5	Basic blocks of linear IC voltage
35	5	Regulators, three terminal voltage regulators,
36	5	Positive and negative voltage regulators.
37	5	The 555 timer as astable and
38	5	Monostable multivibrators.
39	5	Zero crossing detector,
40	5	Schmitt trigger.

TEXT/REFERENCE BOOKS

1 R. A. Gayakwad - Op-amplifiers & Linear ICs, Pearson Education. 2007

2 J. M. Jacob – Applications & Design with Analog Integrated Circuits, Prentice Hall of India.

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Syllabus Deployment

Name of Faculty: Yaswant Soni
Subject Code:4EX1A
Subject Name: Analog Electronics

Department: Department of Electrical Engineering (EE& EEE)
SEM: IV
Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO1 :Analyze different types of filters and regulators.

CO2 :Determine quiescent point, gain, input and output impedance of common emitter and common collector amplifiers.

CO3 :Explain principal of operation of various basic oscillators and feedback amplifiers.

CO4 :Analyze input/output relation for various simple applications of OP-Amp in analog circuits.

CO5 :Explain performance of basic class-A, class-B and class-C power amplifiers.

Lecture No.	Unit	Topic
1	1	**Feedback Amplifiers**: Classification,
2	1	Feedback concept, Feedback Topologies,
3	1	Transfer gain with feedback,
4	1	General characteristics of negative feedback amplifiers
5	1	Analysis of voltage-series, voltage-shunt,
6	1	Current-series and current-shunt feedback
7	1	Amplifier. Stabilitycriterion.

8	1	Compensation techniques, miller compensation.
9	**2**	**Oscillators & Multivibrators**:
10	2	Classification. Criterion for oscillation.Tuned
11	2	Collector, Hartley, Colpitts,
12	2	RC Phase shift, Wien Bridge and
13	2	Crystal oscillators
14	2	Astable, monostable and bistablemultivibrators.
15	2	Schmitt trigger.
16	2	Blockingoscillators
17	**3**	**High Frequency Amplifiers**:
18	3	Hybrid Pi model,
19	3	Conductances and capacitances of
20	3	Hybrid Pi model,
21	3	High frequency analysis of CE amplifier
22	3	Gain bandwidth product,
23	3	Unity gain frequency fT.Emitter follower at high
24	3	Frequencies.
25	**4**	**Tuned Amplifier**: Band pass amplifier,
26	4	Parallel resonant circuits, Band Width of
27	4	Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary &
28	4	Secondary Tuned Amplifier with BJT & FET
29	4	Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse
30	4	Response of such Amplifier.
31	4	Class C tuned amplifiers, Shunt Peaked Circuits for
32	4	Increased Bandwidth.
33	**5**	**Power Amplifiers**: Classification,
34	5	Power transistors &
35	5	power MOSFET (DMOS, VMOS). Output power,
36	5	power dissipation and efficiency analysis of Class A, class
37	5	B, class AB, class C,
38	5	Class D and class E amplifiers as output stages.
39	5	Pushpull amplifiers with and without transformers. Complementary symmetry &

TEXT/REFERENCE BOOKS

1 Millman, Integrated Electronics, ed. 2, TMH. 2010
2 A. S. Sedra, Kenneth C. Smith, Microelectronic Circuits, Oxford university press.

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Syllabus Deployment

Name of Faculty: Kirti Kurdiya Subject Code:4EX6A

Subject Name: Advanced Engineering Mathematics-II

Department: Department of Electrical Engineering (EE& EEE) SEM: IV

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1 : Identify the various methods in Numerical Analysis

CO 2 : Associate physical problems with above mathematical concepts.

CO 3 : Apply above concepts for solving problems in engineering fields.

CO 4 : Analyze complex problems & categorize it into parts and infer the relation between them.

Lecture No.	Unit	Topic
1	1	**Numerical Analysis**: Finite differences - Forward backward and central difference.
2	1	Newton's forward and backward differences interpolation formulae. Sterling's
3	1	Formulae, Lagrange's interpolation formula.
4	1	Solution of non-linear equations in one
5	1	Variable by Newton Raphson and Simultaneous algebraic equation by Gauss and
6	1	Regula Falsi method.
7	1	Solution of simultaneous equations by Gauss elimination and Gauss Seidel

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8	1	Methods. Fitting of curves (straight line and parabola of second degree) by method
9	**2**	**Least squares.**
10	2	Numerical Analysis: Numerical differentiation,
11	2	Numerical integration trapezoidal
12	2	Rule, Simpson's one-third and one eighth rule. Numerical Integration of ordinary
13	2	Differential equations of first order
14	2	Picard's method, Euler's &
15	2	Modified Euler's methods. Miline's method and Runga
16	2	Kutta fourth order method. Simple linear difference equations with constant
17	**3**	**Coefficients.**
18	3	Special Functions: Bessel's function of first and
19	3	Second kind, simple recurrence
20	3	Relations, orthogonal property of Bessel functions,
21	3	Transformation,
22	3	Generating functions
23	3	Legendre's function of first kind,
24	3	Simple recurrence relations, orthogonal property,
25	**4**	**Generating functions.**
26	4	Statistics &
27	4	Probability:
28	4	Elementary theory of probability,
29	4	Baye's theorem with
30	4	Simple applications,
31	4	Expected value.
32	4	Theoretical probability distributions
33	**5**	**Binomial, Poisson and Normal distributions.**
34	5	Statistics & Probability:
35	5	Lines of regression,
36	5	Co-relation and
37	5	Rank correlation.
38	5	Transforms: Z-transforms,
39	5	Its inverse, simple properties and

40	5	Application to difference equations

TEXT/REFERENCE BOOKS

1 Jeffrey, Advanced Engineering Mathematics, ELSEVIER 2006
2 Ervin Kreyzig, Advanced Engineering Maths, John Wiley
3.Bird, Higher Engineering Mathematics , ELSEVIER 2004
4 Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya

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Syllabus Deployment

Name of Faculty: Ms. LalitaVaishnav Subject Code:4EX10A
Subject Name: Electrical Machine Lab

Department: Department of Electrical Engineering (EE& EEE) SEM: IV
Total No of Lab Planned: 12

Lab OUTCOMES

Atthe end of this course students will be able to:

CO1. Able to demonstrate Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed verses field current.

CO2. Able to perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.

CO3. Able to perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.

CO4. Able to plot the O.C.C. & S.C.C. of an alternator and to determine its Zs ,Xd andregulation by synchronous impedance method.

Lab No.	Practical No.	Topic
1	1	Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed verses field current.
2	1	Speed control of D.C. shunt motor by (b) Armature voltage control method & plot the curve for speed verses armature voltage.
3	2	To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage

		regulation and efficiency.
4	3	To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.
5	4	To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
6	5	To plot the O.C.C. & S.C.C. of an alternator and to determine its Zs ,Xdandregulation by synchronous impedance method.
7	6	To plot the V-curve for a synchronous motor for different values of loads.
8	7	To perform the heat run test on a delta/delta connected 3-phase transformer and determine the parameters for its equivalent circuit.
9	8	To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (i) Max. Torque (ii) Current
10	8	To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following: (iii) slips (iv) p.f. (v) Efficiency.
11	9	To Plot V-Curve and inverted V-Curve of synchronous motor.
12	10	To synchronize an alternator across the infinite bus (RSEB) and control load sharing.

TEXT/REFERENCE BOOKS

1. A. E. Fitzgerald, C. KingsleyJr and Umans, Electric Machinery, 6th Edition McGraw Hill, International Student Edition.
2. Kothari &Nagrath, Electric Machines 3/e,TMH

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Syllabus Deployment

Name of Faculty: Rajkumar Soni Subject Code:4EX11A
Subject Name: Electrical Machine Design

Department: Department of Electrical Engineering (EE& EEE) SEM: IV
Total No of Lab Planned: 8

LAB OUTCOMES

Atthe end of this course students will be able to:

CO1. Design of transformers: output of transformer, output equation- volt per turn, core area and weight of iron &copper, optimum design.

CO2. Design of rotating machines: General concepts. Specific loading, output equations –dc machines and ac machines, factor affecting size of rotating machines.

CO3. Design of a 3-phase squirrel cage induction motor.

CO4. Design of synchronous machines: output equation, choice of specific magnetic and electric loadings, main dimensions, short circuit ratio. Design a 3-phase, 2-pole turbo alternator.

Lab No.	Practical No.	Topic
1	1	Design of transformers: output of transformer, output equation- volt per turn, core area and weight of iron &copper, optimum design–(i) minimum cost
2	1	Design of transformers: output of transformer, output equation- volt per turn, core area and weight of iron &copper, optimum design- (ii) minimum losses. Design of core and windings. Design a 3-phase transformer.
3	2	Design of rotating machines: General concepts. Specific

		loading, output equations –dc machines and ac machines, factor affecting size of rotating machines.
4	2	Design of rotating machines: General concepts. Specific loading, output equations- choice of specific magnetic and electric loadings.
5	3	Design of 3-phase induction motors: output equation, choice of air gap flux density and ampere conductor's parameter, main dimensions.
6	4	Design of a 3-phase squirrel cage induction motor.
7	5	Design of single phase induction motors: output equation, main dimensions, relative size of single phase and 3-phase induction motors. Design of a single phase capacitor start induction motor.
8	6	Design of synchronous machines: output equation, choice of specific magnetic and electric loadings, main dimensions, short circuit ratio. Design a 3-phase, 2-pole turbo alternator.

TEXT/REFERENCE BOOKS

1. M. G. Say, The Performance and Design of AC machines, Pit man & Sons.
2. Guru, Electric Machinery 3e, Oxford
3. R. K. Srivastava, Electrical Machines, Cengage Learning.

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Syllabus Deployment

Name of Faculty: Aashika Sharma Subject Code:4EX8A
Subject Name: Electrical Measurement Lab

Department: Department of Electrical Engineering (EE& EEE) SEM: IV
Total No of Lab Planned: 11

Lab OUTCOMES

Atthe end of this course students will be able to:

CO1. Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes.

CO2. Study working and applications of Meggar, Tong-tester, P.F. Meter and Phase Shifter.

CO3. Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) One-wattmeter method.

CO4. Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) One-wattmeter method.

CO5. Able to explain different types of bridges.

Lab No.	Practical No.	Topic
1	1	Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes.
2	2	Study working and applications of Meggar, Tong-tester, P.F. Meter and Phase Shifter.
3	3	Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) One-wattmeter method.
4	4	Calibrate an ammeter using DC slide wire potentiometer.
5	5	Calibrate a voltmeter using Crompton potentiometer.
6	6	Measure low resistance by Crompton potentiometer.
7	7	Measure Low resistance by Kelvin's double bridge.
8	8	Measure earth resistance using fall of potential method.
9	9	Calibrate a single-phase energy meter by phantom loading at different power factors.
10	10	Measure self-inductance using Anderson's bridge.
11	11	Measure capacitance using De Sauty Bridge

TEXT/REFERENCE BOOKS

1. Bell, Electronic Instrumentation And Measurement, Oxford
2. W. D. Cooper, Electronic Inst. & Measurement Techniques, Prentice Hall, India.
3. A. K. Sawhney, Electrical & Electronic Measurement & Inst, DhanpatRai& Sons.

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Syllabus Deployment

Name of Faculty: YashwantSoni Subject Code:4EX9A
Subject Name: Integrated Circuit Lab

Department: Department of Electrical Engineering (EE& EEE) SEM: IV
Total No of Lab Planned: 10

Lab OUTCOMES

Atthe end of this course students will be able to:
CO1. Op-Amp characteristics and get data.
CO2. Design LPF and HPF using Op-Amp 741
CO3. Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
CO4. Design Amplifier (for given gain) using Bipolar Junction Transistor.

Lab No.	Practical No.	Topic
1	1	Op-Amp characteristics and get data for input bias current measure the output-offset voltage and reduce it to zero and calculate slew rate.
2	2	Op-Amp in inverting and non-inverting modes.
3	3	Op-Amp as scalar, summer and voltage follower.
4	4	Op-Amp as differentiator and integrator.
5	5	Design LPF and HPF using Op-Amp 741
6	6	Design Band Pass and Band reject Active filters using Op-Amp 741.
7	7	Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
8	8	Design (i) Astable (ii) Monostablemultivibrators using IC-555

		timer
9	9	Design Triangular & square wave generator using 555 timer.
10	10	Design Amplifier (for given gain) using Bipolar Junction Transistor.

TEXT/REFERENCE BOOKS

1. Ramakalyan: LINEAR CIRCUITS (Includes CD), Oxford.
2. K. R. Botkar – Integrated Circuits, Khanna Publications.
3. Salivahanan: Linear Integrated Circuits (TMH).

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Lab Deployment

Name of Faculty: Dr. Nitin Kothari Subject Code:4EX7A

Subject: Analog Electronics Lab SEM: IV

Department: Electronics and Communication Engineering

Total No. of Lab Planned:08

COURSE OUTCOMES

At the end of this course students will be able to:

CO1: Design and analyze of oscillator circuits

CO2: Evaluate frequency response to understand behavior of feedback amplifier circuits

CO3:Plot characteristics for BJT, FET & UJT

Lab No.	Topic
1	Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1 kHz with and without negative feedback.
2	Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor
3	Plot and study the characteristics of small signal amplifier using FET.
4	Study of push pull amplifier. Measure variation of output power & distortionwith load.
5	Study Wein bridge oscillator and observe the effect of variation in R & C onoscillator frequency
6	Study transistor phase shift oscillator and observe the effect of variation in R& C on oscillator frequency and compare with theoretical value.
7	Study the following oscillators and observe the effect of variation of C onoscillator frequency:(a) Hartley (b) Colpitts.
8	To plot the characteristics of UJT and UJT as relaxation.

TEXT/REFERENCE BOOKS

1.Microelectronic Circuits – Theory and Applications, Adel S Sedra, Kenneth C Smith and Arun N Chandorkar, Oxford University Press
2.Electronic Devices and Circuit Theory, Robert L Boylestad and Louis Nashelsky, Pearson India Education Services Pv Ltd.
3. Electronic Devices and Circuits, J.B. Gupta, S.K. Kataria & Sons.

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Syllabus Deployment

Name of Faculty: Nitin Kothari Subject Code:5EX6.1A
Subject Name: Biomedical Instrumentation

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:
CO1 :Understand the physiology of biomedical system
CO2 :Measure biomedical and physiological information
CO3 :Discuss the application of Electronics in diagnostics and therapeutic area

Lecture No.	Unit	Topic
1	**1**	**Human Body Subsystems**: Brief description of neural,
2	1	muscular, cardiovascular and
3	1	respiratory systems; their electrical,
4	1	mechanical and chemical activities.
5	1	Transducers and Electrodes: Principles and classification of transducers for
6	1	Biomedical applications, Electrode theory,
7	1	different types of electrodes, Selection
8	1	criteria for transducers and electrodes.
9	**2**	**Bio potentials**: Electrical activity of excitable cells,
10	2	ENG, EMG, ECG, ERG, EEG.
11	2	Neuron potential. Cardio Vascular System Measurements: Measurement of blood

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12	2	pressure, blood flow,
13	2	cardiac output, cardiac rate,
14	2	Heartsounds, Electrocardiograph,
15	2	phonocardiograph, Plethysmograph,
16	2	Echocardiograph.
17	**3**	**Instrumentation for Clinical Laboratory**: Measurement of pH valve of blood, ESR
18	3	measurement, hemoglobin measurement,
19	3	O2and CO2concentration in blood, GSR
20	3	measurement. Instrumentation for clinical laboratory: Spectrophotometry,
21	3	chromatography, Hematology, Measurement of pH value, concentration in blood.
22	3	Medical Imaging:DiagnosticX-rays,
23	3	CAT, MRI, thermography, Ultrasonography,
24	3	medical use of isotopes, endoscopy.
25	**4**	**Patient Care**, Monitoring and Safety Measures:Elements of Intensive care
26	4	monitoring basic hospital systems and components,
27	4	physiological effect of electric
28	4	current shock hazards from electrical equipment,
29	4	safety measures, Standards & practices.
30	4	Computer Applications and Biotelemetry:Real time computer applications, data
31	4	acquisition and processing,
32	4	remote data recording and management.
33	**5**	**Therapeutic and Prosthetic Devices**:
34	5	Introduction to cardiac pacemakers,
35	5	defibrillators,
36	5	ventilators,
37	5	muscle stimulators,
38	5	diathermy,
39	5	heart lung machine,
40	5	Hemodialysis, Applications of Laser.

TEXT/REFERENCE BOOKS

1 Webster J.G.: Medical Instrumentation, Application and Design, John Wiley and Sons. 2009

2 Jacobson, B. Webster, J.G., Medical and Clinical Engineering, PHI, International

3 Cromwell: Biomedical Instrumentation and Measurements, et a1, PHI, International 1980

4 R.S. Khandpur: Handbook of Biomedical Instrumentation, MGH.

Techno India NJR Institute of Technology

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Syllabus Deployment

Name of Faculty: CPJain Subject Code:5EX3A
Subject Name:Control System

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:
CO1: Understand the general concept of a system and classify systems into different types and represent a system using different techniques like block diagram, signal flow graph.
CO2: develop transfer function model of mechanical, electrical, thermal, fluid system and different control system components like servomotors, synchros, potentiometer, tacho-generators etc.
CO3: analyze system response and evaluate error dynamics in time domain.
CO4: Determine system stability using routh-hurtwitz (RH) criteria, root locus techniques in time domain and bode plot and nyquist technique in frequency domain.

Lecture No.	Unit	Topic
1	1	**Introduction**: Elements of control systems,
2	1	Concept of open loop and closed loop
3	1	Systems, Examples and application of open loop and closed loop systems, brief idea
4	1	Mmultivariable control systems.
5	1	Mathematical Modeling of Physical Systems: Representation of

		physical
6	1	System (Electro Mechanical) by differential equations, Determination of transfer
7	1	Function by block diagram reduction techniques and signal flow method, Laplace
8	1	Transformation function, inverse Laplace transformation.
9	**2**	**Time Response Analysis of First Order** and
10	2	Second Order System:Characteristic
11	2	Equations, response to step,
12	2	Ramp and parabolic inputs.
13	2	Transient response analysis,
14	2	Steady state errors and error constants,
15	2	Transient & steady state analysis of LTI systems
16	2	Transient & steady state analysis of LTI systems
17	**3**	**Control System Components**:
18	3	Constructional and working concept of ac
19	3	Servomotor, synchronous and stepper motor
20	3	Stability and Algebraic Criteria:
21	3	Concept of stability and necessary conditions,
22	3	Routh-Hurwitz criteria and limitations.
23	3	Root Locus Technique: The root locus
24	3	Concepts, construction of root loci.
25	**4**	**Frequency Response Analysis**:
26	4	Frequency response,
27	4	Correlation between time and
28	4	Frequency responses,
29	4	polar and inverse polar plots,
30	4	Bode plots
31	4	Stability in Frequency Domain: Nyquist stability criterion, assessment of relative
32	4	Stability: gain margin and phase margin, M and N Loci, Nichols chart.
33	**5**	**The design problem and preliminary considerations lead**
34	5	The design problem and preliminary considerations lead
35	5	The design problem and preliminary considerations lead

36	5	Lag and
37	5	lead-lag networks,
38	5	Design of closed loop systems using compensation techniques in time domain and frequency domain.
39	5	Brief idea of proportional,
40	5	Derivative and integral controllers.

TEXT/REFERENCE BOOKS

1. Smarjit Ghosh, Control Systems: Theory and Applications, 2/e, Pearson Publisher. 2004

2 Dhannesh N. Manik: Control System, Cengage Learning. 2012

3 I. J. Nagrath and M. Gopal: Control Systems Engineering, 3rd Ed, New Age Publication.

4 K. R. Varmah: Control Systems, MGH 2010

5 Anandnatrajan et. al.: Control Systems Engineering, 4th ed., Scitech Pub.

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Syllabus Deployment

Name of Faculty: Kirti Subject Code:5EX4A

Subject Name: Data Base Management System

Department: Department of Electrical Engineering (EE& EEE) SEM: V

Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1 :Define basic functions of DBMS & RDBMS.

CO 2: Analyze database models & entity relationship models Design and implement a database schema for a given problem-domain

CO 3: Populate and query a database using SQL DML/DDL commands.

Lecture No.	Unit	Topic
1	**1**	**Introduction**
2	1	need
3	1	purpose and goals of DBMS
4	1	DBMS Architecture, Concept of
5	1	Keys, Generalization and specialization
6	1	Introduction to relational data model
7	1	ER modeling
8	1	Concept of ER diagram
9	**2**	**Database Design:**
10	2	Conceptual Data Base design.
11	2	Theory of normalization, Primitive
12	2	Composite data types

13	2	Concept of physical and logical databases,
14	2	Data abstraction and data independence,
15	2	Relational algebra and
16	2	Relational calculus.
17	**3**	**SQL, DDL and DML.**
18	3	Constraints assertions
19	3	Views database security. Application
20	3	Development using SQL
21	3	Host Language interface embedded SQL programming.
22	3	GL's, Forms management and report writers
23	3	Stored procedures and triggers
24	3	Dynamic SQL, JDBC
25	**4**	**Internal of RDBMS**
26	4	Physical data organization in sequential
27	4	Indexed
28	4	random and
29	4	hashed files
30	4	Inverted and
31	4	Multi-list structures
32	4	Multi-list structures
33	**5**	**Transaction Management**:
34	5	Transaction concept,
35	5	Transaction state, serializability,
36	5	Conflict serializability, views serializability.
37	5	Concurrency Control:
38	5	Lock based protocol.
39	5	Deadlock Handling: Prevention detection,
40	5	Recovery. (iv) Recovery System:

TEXT/REFERENCE BOOKS

1 Silverschatz Korth and Sudarshan: Database System Concepts, 6th ed., MGH. 2011

2 Raghu Rama Krishnan: Database Management Systems, 2nd ed., MGH.

3 S. K Singh: Database System Concepts, Designs and Applications,

Pearson Education

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Syllabus Deployment

Name of Faculty: Vivek Jain Subject Code:5EX6.2A
Subject Name: Principle of Communication Systems

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1:Analyze and compare different analog modulation schemes for their efficiency and bandwidth.

CO2: Analyze the behaviour of a communication system in presence of noise.

CO3: Investigate pulsed modulation system and analyze their system performance.

Lecture No.	Unit	Topic
1	**1**	**Noise Effects in Communication Systems:**
2	1	Resistor noise, Networks with reactive
3	1	Elements, Noise temperature,
4	1	Noise bandwidth,
5	1	Effective input noise
6	1	Temperature,
7	1	Noise figure. Noise figure &
8	1	Equivalent noise temperature in cascaded circuits. 6
9	**2**	**Amplitude Modulation:**
10	2	Frequency translation, Recovery of base band signal,
11	2	Spectrum & power relations in AM systems.
12	2	Methods of generation &

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13	2	Demodulation of AM-DSB,
14	2	AMDSB/SC and AM-SSB
15	2	Signals. Modulation & detector circuits for AM systems. AM transmitters &
16	2	Receivers.
17	**3**	**Frequency Modulation: Phase & freq.**
18	3	Modulation & their relationship,
19	3	Spectrum &bandwidth of a sinusoidally modulated FM signal,
20	3	Phasor diagram, Narrow
21	3	Band & wide band FM. Generation &
22	3	Demodulation of FM signals.
23	3	FM transmitters & receivers, Comparison of AM,
24	3	FM & PM. Pre emphasis & deemphasis.
25	**4**	**Threshold in FM, PLL demodulator.**
26	4	Noise in AM and FM:
27	4	Calculation of signal-to-noise ratio in SSB-SC,
28	4	DSBSC,
29	4	DSB with carrier,
30	4	Noise calculation of square law demodulator &
31	4	Envelope detector.
32	4	Calculation of S/N ratio in FM demodulators,
33	**5**	**Super-heterodyne receivers.**
34	5	Pulse Modulation Systems
35	5	Pulse Modulation Systems
36	5	Sampling theorem,
37	5	Generation and
38	5	Demodulation
39	5	Methods of PAM,
40	5	PWM,

TEXT/REFERENCE BOOKS

1. Principles of Communication Systems, Herbert Taub, Donald Schilling, Goutam Saha, TMH
2. An Introduction To Analog & Digital Communications, Haykins, Wiley

3. Communication Systems Engineering, Proakis J. G. and Salehi M., Pearson Education

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Syllabus Deployment

Name of Faculty: Abrar Subject Code:5EX1A

Subject Name: Power Electronics

Department: Department of Electrical Engineering (EE& EEE) SEM: V

Total No of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1. Acquire knowledge of switching characteristics of various Power Semiconductor devices and able to design and simulate their base/gate drive circuits

CO2. Analyze different controlled rectifier circuits and computing their performances.

CO3. Analyze different dc-dc converter circuits (isolated and non-isolated type) and computing their performances.

CO4. Analyze single phase and three phase Voltage Source Inverter circuit topology with Sin PWM control, Space Vector PWM control and computing their performances..

Lecture No.	Unit	Topic
1	1	**Power Semiconductor Devices**: Construction,
2	1	Principle of operation,
3	1	Characteristics
4	1	Applications of Power Transistor& Thyristor.
5	1	Characteristics of GTO, DIAC, MCT,
6	1	TRIAC, Power MOSFET and IGBT; Two-

7	1	Transistor Model of Thyristor,
8	1	Thyristor Commutation methods.
9	**2**	**SCR:** Construction and characteristics,
10	2	Specification and ratings, pulse transformer,
11	2	Optical isolators, methods of turn on, triggering circuits for SCR: R, RC, UJT
12	2	Relaxation oscillator.
13	2	Rating extension by series and parallel connections,
14	2	String efficiency. Protection of
15	2	SCR-Protection against over voltage, over current,
16	2	Dv/dt, di/dt, Gate protection.
17	**3**	**Converters-I:** Single Phase half &
18	3	Full wave converters with RL & RLE load, Single
19	3	Phase dual converters
20	3	Phase dual converters
21	3	Three phase half wave converters
22	3	Three phase half wave converters
23	3	Three phase full converters with RL load
24	3	Three phase dual converters
25	**4**	**Converters-II:** Single and three-phase semi converters
26	4	With RL & RLE load.
27	4	Power factor improvement-Extinction angle control,
28	4	Symmetrical angle control,
29	4	Pulse width modulation control
30	4	Pulse width modulation control
31	4	Sinusoidal pulse width modulation control
32	4	Sinusoidal pulse width modulation control.
33	**5**	**Inversion operation.**
34	5	Effect of load and source impedances.
35	5	DC-DC Converters:
36	5	Step Up/Down Copper,
37	5	Control strategies, Chopper
38	5	Configurations,
39	5	Analysis of type A Chopper
40	5	Voltage, current and load commutated chopper.

TEXT BOOK/REFERENCE BOOK

1. M. H. Rashid," Power electronics: circuits, devices, and applications", Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland," Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
3. R. W. Erickson and D. Maksimovic," Fundamentals of Power Electronics", Springer Science & Business Media, 2007.
4. L. Umanand," Power Electronics: Essentials and Applications", Wiley India, 2009

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Syllabus Deployment

Name of Faculty: Neha Tak Subject Code:5EX5A
Subject Name: Transmission & Distribution of Electrical Power
Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1. Learn the basics of various fundamentals of electrical power generation, transmission & distribution.

CO 2. Learn transmission line parameters, their calculations also the effects on transmission lines.

CO 3. Learn electrical characteristics of transmission line such as types of transmission lines, various effects on transmission & per unit representation of power system.

CO 4. Learn Mechanical design along with the types of insulators.

CO 5. Learn information regarding conductors and insulation, different types of underground cable parameters and power system earthing.

Lecture No.	Unit	Topic
1	1	**Supply systems**: Basic network of power system.
2	1	Transmission and distribution
3	1	Voltage, effect of system voltage on size of conductor and losses.
4	1	Comparison of DC 2- wire,
5	1	DC 3-wire, 1-phase AC and 3-phase AC (3-wire and 4-wire) systems.

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6	1	Distribution Systems: Primary and secondary distribution systems, feeder, distributor
7	1	Service mains. Radial and ring- main distribution systems.
8	1	Kelvin's law for conductor size.
9	**2**	**Mechanical Features** of Overhead Lines:
10	2	Conductor material and types of conductor.
11	2	Conductor arrangements and spacing.
12	2	Calculation of sag and tension,
13	2	Supports at different levels,
14	2	Effect of wind and
15	2	Ice loading, stringing chart and sag template.
16	2	Conductor vibrations and vibration dampers.
17	**3**	**Parameters of Transmission** Lines: Resistance inductance and capacitance of
18	3	Overhead lines, effect of earth,
19	3	line transposition. Geometric mean radius and distance.
20	3	Inductance and capacitance of line with symmetrical and unsymmetrical spacing
21	3	Inductance and capacitance of double circuit lines.
22	3	Skin and proximity
23	3	Effects. Equivalent circuits and performance of short and
24	3	medium transmission lines.
25	**4**	**Generalized ABCD** Line Constants:equivalent circuit and performance of long
26	4	Transmission line. Ferranti effect.
27	4	Interference with communication circuits. Power
28	4	Flow through atransmission line
29	4	Corona: Electric stress between parallel conductors.
30	4	Disruptive critical voltage and
31	4	Visual critical voltage, Factors affecting corona.
32	4	Corona power loss. Effects of corona.
33	**5**	**Insulators**: Pin, shackle, suspension,
34	5	Post and strain insulators. Voltage distribution
35	5	Across an insulator string,
36	5	Grading and methods of improving string efficiency.

37	5	Underground Cables: Conductor, insulator, sheathing and armoring materials.
38	5	Types of cables. Insulator resistance and capacitance calculation. Electrostatic stresses
39	5	Reduction of maximum stresses. Causes of breakdown. Thermal rating of cable.
40	5	Introduction to oil filled and gas filled cables

TEXT/REFERENCE BOOKS

1 S. Sivanagaraju and S. Satyanarayana: Electric Power Transmission and Distribution, Pearson Publisher.

2 A. S. Pabla: Electric Power Distribution, MGH.

3 B. R. Gupta: Power System Analysis & Design, S. Chand Publishers.

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Syllabus Deployment

Name of Faculty: Yogendra Solanki Subject Code:5EX6.3A
Subject Name: Introduction to VLSI

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:

CO 1. Interpret the submicron issues in VLSI Design.
CO 2. Design different CMOS circuits using various logic families along with their circuit layout.
CO 3. Analyze parasitic effects, switching delays, power dissipation issues in VLSI designs.
CO 4. Implement VLSI IC design using EDA tools.

Lecture No.	Unit	Topic
1	**1**	**Introduction to MOS Technology:**
2	1	Basic MOS transistors,
3	1	Enhancement Mode
4	1	Enhancement Mode
5	1	Transistor action,
6	1	Depletion Mode transistor action,
7	1	NMOS and
8	1	CMOS fabrication.
9	**2**	**Basic Electrical Properties of MOS Circuits:**
10	2	Versus relationship,

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11	2	Aspects of threshold voltage,
12	2	Transistor Trans conductance gm.
13	2	The NMOS inverter,
14	2	Pull up to Pull-down ratio for a NMOS Inverter and CMOS
15	2	Inverter,
16	2	MOS transistor circuit Model, Noise Margin.
17	**3**	**CMOS Logic Circuits**: The inverter,
18	3	Combinational Logic, NAND Gate NOR gate,
19	3	Compound Gates, 2
20	3	Input CMOS Multiplexer,
21	3	Memory latches and registers
22	3	Transmission Gate, Gate delays,
23	3	CMOS-Gate Transistor sizing,
24	3	Power dissipation
25	**4**	**Basic Physical Design of Simple Gates** and
26	4	Layout Issues:
27	4	Layout issues for inverter,
28	4	Layout for NAND and
29	4	NOR Gates,
30	4	Complex Logic gates Layout,
31	4	Layout optimization for performance.
32	4	Layout optimization for performance
33	**5**	**Introduction to VHDL**
34	5	Verilog &
35	5	Other design tools.
36	5	VHDL Code for simple Logic
37	5	Gates, flip-flops,
38	5	Shift-registers, Counters,
39	5	Multiplexers,
40	5	Adders and subtractors.

TEXT/REFERENCE BOOKS

1 S. M. Sze: VLSI Technology, MGH. 2003

2 Debaprasad Das: VLSI Design, Oxford

3 Angsuman Sarkaret. al.: VLSI Design and EDA Tools, Scitech Pub

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Syllabus Deployment

Name of Faculty: Vivek Jain Subject Code:5EX2A
Subject Name: Analog Communication

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1:Analyze and compare different analog modulationschemes for their efficiency and bandwidth.

CO2: Analyze the behavior of a communication system in presence of noise.

CO3: Investigate pulsed modulation system and analyze their system performance.

Lecture No.	Unit	Topic
1	**1**	**Noise Effects in Communication Systems:**
2	1	Resistor noise, Networks with reactive
3	1	elements, Noise temperature
4	1	Noise bandwidth,
5	1	Effective input noise temperature
6	1	Noise figure. Noise figure &
7	1	equivalent noise
8	1	temperature in cascaded circuits.
9	**2**	**Amplitude Modulation: Frequency translation**
10	2	Recovery of base band signal
11	2	Spectrum & power relations in AM systems.
12	2	Methods of generation & demodulation of

13	2	AM-DSB, AM-DSB/SC and
14	2	AM-SSBsignals.
15	2	Modulation & detector circuits for AM systems.
16	2	AM transmitters & receivers.
17	**3**	**Frequency Modulation:**
18	3	Phase & freq. modulation & their relationship, Spectrum &
19	3	band width of a sinusoidally modulated FM signal,
20	3	phasor diagram, Narrow band &
21	3	wide band FM. Generation & demodulation of FM signals.
22	3	FM transmitters &receivers. Comparison of AM,
23	3	FM & PM. Pre emphasis &
24	3	Femphasis. Threshold in FM, PLL demodulator.
25	**4**	**Noise in AM and FM:**
26	4	Calculation of signal-to-noise ratio in SSB-SC,
27	4	DSBSC,
28	4	DSB with carrier,
29	4	Noise calculation of square law demodulator &
30	4	Envelope detector.
31	4	Calculation of S/N ratio in FM demodulators,
32	4	Super heterodyne receivers.
33	**5**	Pulse Analog Modulation:
34	5	Practical aspects of sampling:
35	5	Natural and flat top sampling.
36	5	PAM,
37	5	PWM,
38	5	PPM modulation and
39	5	Demodulation methods,
40	5	PAM-TDM

TEXT/REFERENCE BOOKS

1. Principles of Communication Systems, Herbert Taub, Donald Schilling, Goutam Saha, TMH
2. An Introduction To Analog & Digital Communications, Haykins, Wiley
3. Communication Systems Engineering, Proakis J. G. and Salehi M., Pearson

Education

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SyllabusDeployment

Name of Faculty: Miss. Payal Paliwal — Subject Code:5EX8A

Subject Name:Communication Lab — SEM: V

Department: Department of Electrical and Electronics Engineering

Total no. of experiments: 11

COURSE OUTCOMES

At the end of this course students will be able to:

CO1:Understand different analog modulation schemes andevaluate modulation index

CO2: Able to understand the principle of superhetrodynereceiver

CO3: Develop time division multiplexing concepts in real timeapplications

CO4: Develop and able to comprehend different dataformatting schemes

CO5: Comprehend and analyze the concepts of different digitalmodulation techniques in communication.

S. No.	Name of Experiments
1	Harmonic analysis of a square wave of modulated waveform.
2	Observe the amplitude modulated waveform and measures modulation index.Demodulation of the AM signal.
3	To modulate a high frequency carrier with sinusoidal signal to obtain FM signal.Demodulation of the FM signal.
4	To observe the following in a transmission line demonstrator kit : i. The propagation of pulse in non-reflecting Transmission line. ii. The effect of losses in Transmission line. iii. The resonance characteristics of al half wavelength long x-mission line.
5	To study and observe the operation of a super heterodyne receiver
6	To modulate a pulse carrier with sinusoidal signal to obtain PWM signal anddemodulate it.

7	To modulate a pulse carrier with sinusoidal signal to obtain PPM signal anddemodulate it.
8	To observe pulse amplitude modulated waveform and its demodulation.
9	To observe the operation of a PCM encoder and decoder .To considers reason for usingdigital signal x- missions of analog signals.
10	Produce ASK signals, with and without carrier suppression, Examine the differentprocesses required for demodulation in the two cases.
11	To observe the FSK wave forms and demodulate the FSK signals based on theproperties of (a) Tuned circuits (b) On PI.L.

TEXT/REFERENCE BOOKS

1. Principles of Communication Systems, Herbert Taub, Donald Schilling, Goutam Saha, TMH
2. An Introduction To Analog & Digital Communications, Haykins, Wiley
3. Communication Systems Engineering, Proakis J. G. and Salehi M., Pearson Education.

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Syllabus Deployment

Name of Faculty: Pankaj Ameta Subject Code:5EX10A
Subject Name: DBMS Lab

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lab Planned: 8

Lab OUTCOMES

Atthe end of this course students will be able to:

1. Designing database and constraints using DDL statements.
2. Database connectivity using JDBC/ODBC.
3. Designing front end in HLL and accessing data from backend database.
4. Project for generating Electricity Bills

Lab No.	Practical No.	Topic
1	1	Designing database and constraints using DDL statements.
2	2	Experiments for practicing SQL query execution on designed database.
3	3	Database connectivity using JDBC/ODBC.
4	4	Features of embedded SQL.
5	5	Designing front end in HLL and accessing data from backend database.
6	6	Designing simple projects using front end-back end programming

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7	7	Project for generating Electricity Bills
8	8	Project for managing student's attendance/marks details.

TEXT/REFERENCE BOOKS

1. S. K Singh: Database System Concepts, Designs and Applications, Pearson Education
2. Elmasari: Fundamentals of Data Base Systems, Pearson Education.

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Syllabus Deployment

Name of Faculty: Rajkumar Soni Subject Code:5EX7A
Subject Name: Power Electronics Lab

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lab Planned: 12

Lab OUTCOMES

Atthe end of this course students will be able to:

CO1. Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.

CO2. Find V-I characteristics of TRIAC, DIAC, MOSFET and IGBT

CO3. Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.

CO4. Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.

Lab No.	Practical No.	Topic
1	1	Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.
2	2	Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.
3	3	Find V-I characteristics of TRIAC and DIAC.
4	4	Find output characteristics of MOSFET and IGBT.
5	5	Find transfer characteristics of MOSFET and IGBT.

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6	6	Find UJT static emitter characteristics and study the variation in peak point and valley point.
7	7	Study and test firing circuits for SCR-R, RC and UJT firing circuits.
8	8	Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.
9	9	Study and obtain waveforms of single-phase half wave controlled rectifier with and without filters. Study the variation of output voltage with respect to firing angle.
10	10	Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.
11	11	Study and obtain waveforms of single-phase full controlled bridge converter with R and RL loads. Study and show rectification and inversion operations with and without freewheeling diode.
12	12	Control the speed of a dc motor using single-phase half controlled bridge rectifier and full controlled bridge rectifier. Plot armature voltage versus speed characteristics.

TEXT/REFERENCE BOOKS

1. O. P. Arora: Power Electronics Laboratory-Experiments and Organization, Narosa Pub
2. P. B. Zbar: Industrial Electronics- A Text-Lab Manual, MGH.

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Syllabus Deployment

Name of Faculty: CP Jain Subject Code: 5EX11A

Subject Name: PROFESSIONAL ETHICS AND DISASTERS MANAGEMENT

Department: Department of Electrical Engineering (EE& EEE) SEM: V

Total No of Lab Planned: 9

Lab OUTCOMES

At the end of this course students will be able to:

CO1. To appreciate the importance and values and ethics in implementing the technology and ensure sustainable development, happiness and prosperity.

CO2. To understand the co-existence with nature and to be aware of potential natural and manmade disasters.

Lab No.	Practical No.	Topic
1	1	Human Values: Effect of Technological Growth and Sustainable Development.
2	1	Profession and Human Values: Values crisis in contemporary society. Nature of values. Psychological Values, Societal Values and Aesthetic Values. Moral and Ethical values.
3	2	Professional Ethics: • Professional and Professionalism-Professional Accountability, Role of a professional, Ethic and image of profession.
4	2	Engineering Profession and Ethics-Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world.
5	2	Professional Responsibilities-Collegiality, Loyalty,

		Confidentially, Conflict of Interest, Whistle Blowing
6	3	Disaster Management: Understanding Disasters and Hazards and related issues social and environmental. Risk and Vulnerability.
7	3	Types of Disasters, their occurrence/ causes, impact and preventive measures: Natural Disasters- Hydro-meteorological Based Disasters like Flood, Flash Flood
8	3	Types of Disasters, their occurrence/ causes, impact and preventive measures: Cloud Burst, Drought, Cyclone, Forest Fires; Geological Based Disasters like Earthquake, Tsunami, Landslides, Volcanic Eruptions.
9	4	Manmade Disasters: Chemical Industrial Hazards, Major Power Break Downs, Traffic Accidents, Fire Hazards, Nuclear Accidents. Disaster profile of Indian continent. Case studies. Disaster Management Cycle and its components.

TEXT/REFERENCE BOOKS

1. R Subramanian: Professional Ethics, oxford publishers.
2. Engineering Ethics: Concepts and cases by Charles E. Harris, Jr., Michael S. Pritchard, MichaelJ. Rabins. Cengage Learning, Delhi
3. Stephen H. Unger: Controlling Technology- Ethics and Responsible Engineers, John Willey and Sons.

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Syllabus Deployment

Name of Faculty: CP Jain Subject Code: 5EX9A
Subject Name: System Programming Lab

Department: Department of Electrical Engineering (EE& EEE) SEM: V
Total No of Lab Planned: 6

Lab OUTCOMES

Atthe end of this course students will be able to:
CO1. Idea about simulink, problems based on simulink.
CO2. Write a program to generate Machine Op- code table using two pass Assembler.
CO3. Multi-dimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation

Lab No.	Practical No.	Topic
1	1	Basics of MATLAB matrices and vectors, matrix and array operations
2	2	Saving and loading data, plotting simple graphs, scripts and functions
3	3	Script files, Function files, Global Variables, Loops, Branches
4	4	Control flow, Advanced data objects,
5	5	Multi-dimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation.
6	6	Numerical integration, Ordinary differential equation. (All contents is to be covered with tutorial sheets)

TEXT/REFERENCE BOOKS

1. AlmosGilat: MATLAB: An Introduction with Applications, Wiley India Ltd., 2004.
2. Ram N. Patel et. al.: Programming in MATLAB, Pearson.

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Syllabus Deployment

Name of Faculty: Chandra Prakash Jain Subject Code:6EX1A

Subject Name: Modern Control Theory

Department: Department of Electrical Engineering (EE& EEE) SEM: VI

Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1:Various terms of basic and modern control system for the real time analysis and design of control systems.

CO2:To perform state variables analysis for any real time system.

CO3:Apply the concept of optimal control to any system.

CO4:Able to examine a system for its stability, controllability, and observability.

CO5: Implement basic principles and techniques in designing linear control systems.

Lecture No.	Unit	Topic
1	1	**INTRODUCTION**: Concept of Linear vector space Linea Independence
2	1	Bases & Representation
3	1	Domain and range. Concept of Linearity, relaxedness
4	1	Time invariance, causality.
5	1	State Space Approach of Control System Analysis: Modern V conventional
6	1	Control theory, concept of state, state variable state vector, stat space, state
7	1	Space equations, Writing state space equations of mechanica Electrical systems

8	1	Analogous systems.
9	**2**	**STATE SPACE REPRESENTATION** using physical and phase variables, comparison
10	2	Form of system representation.
11	2	Block diagram representation of state model.
12	2	Signal flow graph representation.
13	2	State space representation using canonical variables.
14	2	Diagonal matrix.
15	2	Jordan canonical form,
16	2	Derivation of transfer functions from state-model.
17	**3**	**SOLUTION OF STATE EQUATIONS**: Overview
18	3	Eigen values and Eigen vectors.
19	3	Matrix. Exponential,
20	3	State transition matrix, Properties of state transition matrix.
21	3	Computation of State transition
22	3	Matrix concepts of controllability
23	3	Observability
24	3	Pole placement by state feedback
25	**4**	**DIGITAL CONTROL SYSTEMS**: Introduction,
26	4	Sampled data control systems, signal
27	4	Reconstruction
28	4	Difference equations.
29	4	The z-transform
30	4	Z-Transfer
31	4	Block diagram analysis of sampled data
32	4	Systems, z and s domain relationship.
33	**5**	**MODELING OF SAMPLE-HOLD CIRCUIT,** Sample-Hold Circuit,
34	5	Steady state accuracy
35	5	Stability in z-plane and Jury
36	5	Stability criterion, bilinear transformation
37	5	Routh-Hurwitz criterion on s-planes
38	5	Digital PID controllers
39	5	Introduction to adaptive control
40	5	Introduction to adaptive control

TEXT/REFERENCE BOOKS

1 I. J. Nagrath and M. Gopal: Control Systems Engineering, 3rd Ed, New Age Publication.

2 S. K. Bhattacharya: Control Systems Engineering, 3e, Pearson Publishers

3 Dhannesh N. Manik: Control System, Cengage Learning.

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Syllabus Deployment

Name of Faculty: Vivek Jain Subject Code:6EX5A

Subject Name: Microprocessor and Micro Controller

Department: Department of Electrical Engineering (EE& EEE) SEM: VI

Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1:Develop assembly language programming skills.

CO2: Able to build interfacing of peripherals like, I/O, A/D, D/A, timer etc.

CO3:Develop systems using different microcontrollers.

CO4:Understand 8051 processors microcontroller based systems

Lecture No.	Unit	Topic
1	**1**	**INTRODUCTION**: Overview
2	1	CPU, address bus
3	1	Data bus and control bus.
4	1	Input/ Output devices
5	1	Buffers
6	1	Encoders,
7	1	Latches a
8	1	Memories.
9	**2**	**8085 MICROPROCESSOR ARCHITECTURE:** Overview
10	2	Internal data operations
11	2	Registers
12	2	Pins
13	2	Signals
14	2	Peripheral devices and memory organization

15	2	Interrupts. CISC and RISC
16	2	Architecture overview.
17	**3**	**8085 MICROPROCESSOR INSTRUCTIONS:** Overview
18	3	Classification
19	3	Format
20	3	Timing.
21	3	Instruction set.
22	3	Programming
23	3	Debugging,
24	3	8 bit and 16 bit instructions.
25	**4**	**8085 MICROPROCESSOR INTERFACING:** Overview
26	4	8259
27	4	8257
28	4	8255
29	4	8253
30	4	8155 chips and their
31	4	Applications. A/D conversion,
32	**5**	**MEMORY, KEYBOARD AND DISPLAY INTERFACE (8279).** Overview
33	**5**	Introduction To 8051 Microcontroller:
34	5	General features
35	5	Architecture of 8051.
36	5	Memory
37	5	Timers
38	5	Interrupts.
39	5	Pin details.
40	5	Interfacing and applications.

TEXT/REFERENCE BOOKS

1. Microprocessors Architecture, Programming &Application, Ramesh S. Gaonkar, (2000).
2. A Textbook of Microprocessors and Microcontrollers, R.S. Kaler I.K International Publishing House Pvt. Ltd.
3. Introduction to Microprocessors, A.P. Mathur, Mc Graw Hill.

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Syllabus Deployment

Name of Faculty: Pankaj Chittora Subject Code:6EX2A

Subject Name: Neural Network

Department: Department of Electrical Engineering (EE& EEE) SEM: VI

Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1:Student having the knowledge of Neurophysiology.

CO2:Student having the knowledge of Perception.

CO3: Student having the knowledge of Fuzzy Logic and Control System.

CO4:Student having the knowledge of Defuczzication methods

Lecture No.	Unit	Topic
1	**1**	**INTRODUCTION:** Introduction To Neural Networks,
2	1	Biological basis for NN, Human
3	1	Brain, Models of a Neuron
4	1	Directed Graphs, Feedback
5	1	Network architectures
6	1	Knowledge representation
7	1	Artificial intelligence
8	1	Neural Networks
9	**2**	**LEARNING PROCESSES:** Introduction
10	2	Error-Correction learning
11	2	Memory -based
12	2	Learning, Hebbian learning
13	2	Competitive learning
14	2	Boltzmann learning

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15	2	Learning with a Teacher & without a teacher
16	2	Learning tasks, Memory, Adaptation
17	3	Single Layer Perceptions
18	**3**	**INTRODUCTION** Least-mean-square algorithm
19	3	Least-mean-square algorithm
20	3	Learning
21	3	Curves
22	3	Learning rate Annealing Techniques
23	3	Perceptron, Perceptron Convergence
24	3	Theorem.
25	**4**	**MULTILAYER PERCEPTRONS:** Overview
26	4	Introduction,
27	4	Back-Propagation Algorithm
28	4	XOR Problem,
29	4	Output representation and Decision rule
30	4	Feature Detection, Back-Propagation
31	4	Differentiation
32	4	Hessian Matrix, Generalization.
33	**5**	**RADIAL-BASISFUNCTION NETWORKS** Overview
34	5	Self-organizing Maps: Introduction to Radial
35	5	Basis function networks
36	5	Cover's Theorem on the Separability of Patterns
37	5	Interpolation Problem
38	5	Generalized Radial-Basis function networks, XOR Problem.
39	5	Self-Organizing map, Summary of SOM Algorithm
40	5	Properties of the feature map

TEXT/REFERENCE BOOKS

1. Artificial Neural Network,RobertSchalloff,TMH (1997).
2. Neural Network Algorithm And Programing Tech,James A Freeman,Pearson. (1991).
3. Introduction to artificial neural systems, Jacek M. Zurada, Jaico Publ. House, (1994).
4. Introduction to Neural Networks using MATLAB 6.0, S.N. Sivanandam, S. Sumathi and S.N. Deepa,Tata McGraw-Hill, (2006).

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Syllabus Deployment

Name of Faculty: Chandra Prakash Jain Subject Code: 6EX6.2A

Subject: Power System Instrumentation

Department: Department of Electrical Engineering (EE& EEE) SEM: VI

Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1 :Sensors and process control techniques &Computer application in process control

CO2 :Analyze different methods of interfacing sensors with amplifiers and digital circuits

CO3 :Design signal conditioning and analog controllers for process control

.

Lecture No.	Unit	Topic
1	**1**	**THEORY OF ERRORS:** overview
2	1	Accuracy
3	1	Precision, systematic
4	1	Random errors, limits of error
5	1	Probable error
6	1	Standard deviation.
7	1	Gaussian error curves
8	1	Combination of errors
9	**2**	**TRANSDUCERS CONSTRUCTION:** Operating Characteristics
10	2	Operating Characteristics of active and digital
11	2	Transducers, Measurement of temperature

12	2	Pressure, displacement
13	2	Acceleration, noise level.
14	2	Instrumentation for strain
15	2	Displacement
16	2	Velocity, acceleration, force, torque and temperature.
17	**3**	**SIGNAL CONDITIONING** : Introduction
18	3	Signal Conditioning: Instrumentation amplifiers,
19	3	Isolation amplifiers, analog
20	3	Multipliers, analog dividers
21	3	Function generators, timers
22	3	Sample and hold
23	3	Optical and magnetic isolators.
24	3	Frequency to voltage converters
25	**4**	**TEMPERATURE TO CURRENT CONVERTERS.** Shielding
26	4	Grounding.
27	4	Power System Instrumentation-I
28	4	Measurement of voltage
29	4	Current, phase angle
30	4	Frequency
31	4	Active power
32	4	Reactive power in power plants.
33	**5**	**ENERGY METERS** : Introduction
34	5	Multipart tariff meters. Basic idea of LT & HT panel's.
35	5	Power System Instrumentation-II:
36	5	Capacitive voltage transformers
37	5	Their transient behavior
38	5	Current Transformers for measurement and
39	5	Protection
40	5	Composite

TEXT/REFERENCE BOOKS

1 R. H. Cerni and L. E. Foster: Instrumentation for Engineering Measurements, John Wiley and Sons. 1962

2 Curtis and D. Hohnson: Process Control Instrumentation Technology, John Wiley and sons

3 R. Morrison: Instrumentation Fundamentals and Applications, John Wiley and Sons.

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Syllabus Deployment

Name of Faculty: Rajkumar Soni Subject Code:6EX3A

Subject Name: SWITCHGEAR & PROTECTION

Department: Department of Electrical Engineering (EE& EEE) SEM: VI

Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

. CO1: Acquire the knowledge of various abnormal conditions that could occur in power system.

CO2: Ability to design various protective devices in power system for protecting equipment and personnel.

CO3: Knowledge of various types of existing circuit breakers, their design and constructional details.

CO4: Knowledge of various conventional relays,their design and latest developments.

CO5: Knowledge of standards and specifications related to switchgear and protection.

Lecture No.	Unit	Topic
1	1	**STATIC RELAYS**: Introduction to static relays, merits an demerits.
2	1	Comparators: amplitude and phase comparators, duality betwee amplitude and
3	1	Phase comparators. Introduction to (a) amplitude comparator circulating current
4	1	Type, phase splitting type and sampling type
5	1	(b) Phase comparators-vector

6	1	Product type and coincidence type.
7	1	Static Over Current Relays: Introduction to instantaneous, definite time, inverse
8	1	Time and directional over current relays.
9	**2**	**STATIC DIFFERENTIAL RELAYS**: Overview
10	2	Brief description of static differential relay schemes single
11	2	Phase and three phase schemes.
12	2	Introduction to static differential protection of generator and
13	2	Transformer.
14	2	Static Distance Relays
15	2	Introduction to static reactance and
16	2	Mho relays
17	**3**	**CARRIER CURRENT PROTECTION**: Basic apparatus and
18	3	Scheme of power line carrier
19	3	System. Principle of operation of directional comparison and phase comparison
20	3	Carrier protection and carrier assisted distance protection.
21	3	Distance Protection: Effect of power swings on the performance of distance
22	3	Protection. Out of step tripping and blocking relays
23	3	Mho relay with blinders.
24	3	Introduction to quadrilateral and elliptical relays.
25	**4**	**CIRCUIT BREAKERS**-I:Electric arc and its characteristics, arc interruption-high
26	4	Resistance interruption and current zero interruption. Arc interruption theories
27	4	Recovery rate theory and energy balance theory.
28	4	Restriking voltage and recovery voltage
29	4	Develop expressions for restriking voltage
30	4	RRRV. Resistance switching, current chopping and interruption of capacitive Current.
31	4	Oil circuit breakers-bulk oil and minimum oil circuit breakers. Air circuit
32	5	Breakers. Miniature Circuit breaker (MCB).
33	**5**	**CIRCUIT BREAKERS-II**: Air blast

34	5	SF6 and vacuum circuit breakers.
35	5	Selection of circuit breakers
36	5	Rating of circuit breakers.
37	5	Digital Protection: Introduction to digital protection. Brief description of block
38	5	Diagram of digital relay. Introduction to digital over current,
39	5	Transformer differential and
40	5	Transmission line distance protection.

TEXT/REFERENCE BOOKS

1 Bhavesh Bhalja, R. P. Maheshari and Nilesh G. Chothani: Protection and Switchgear, Oxford.

2 Bhuvanesh A. Oza and Nair: Power System Protection and Switchgear, MGH. 2010

3 B. Ravindranath and M. Chander: Power system Protection and Switchgear, Wiley.

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Syllabus Deployment

Name of Faculty: Ashiaka Sharma
Subject Code:6EX6.1A
Subject Name: Smart Grid Technology
Department: Department of Electrical Engineering (EE& EEE)
SEM: VI
Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1 Understand the features of Smart Grid.

CO2 Assess the role of automation in Transmission and Distribution

CO3 Apply Evolutionary Algorithms for the Smart Grid and Distribution Generation.

CO4 Understand operation and importance of PMUs, PDCs, WAMS, Voltage and Frequency control in Micro Grids.

Lecture No.	Unit	Topic
1	1	**INTRODUCTION :**To Smart Grid
2	1	Evolution of Electric Grid, Concept, Definitions and
3	1	Need for Smart Grid, Smart grid drivers
4	1	Functions, opportunities,
5	1	Challenges and benefits
6	1	Difference between conventional & Smart Grid, Concept of Resilient &Self-Healing
7	1	Grid, Present development & International policies in Smart Grid, Diverse
8	1	Perspectives from experts and global Smart Grid initiatives.

9	**2**	**SMART GRID TECHNOLOGIES:** Technology Drivers
10	2	Technology Drivers, Smart energy resources, Smart
11	2	Substations, Substation Automation
12	2	Feeder Automation ,Transmission systems
13	2	EMS, FACTS and HVDC, Wide area monitoring
14	2	Protection and Control, Distribution Systems: DMS, Volt/Var control, Fault
15	2	Detection, Isolation and service restoration, Outage management, High-Efficiency
16	2	Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric
17	**3**	**VEHICLES (PHEV).** Smart Meters
18	3	Smart Meters and Advanced Metering Infrastructure: Introduction to Smart
19	3	Meters, Advanced Metering infrastructure (AMI)
20	3	Drivers and benefits, AMI protocols
21	3	Standards and initiatives
22	3	AMI needs in the smart grid
23	3	Phasor Measurement, Unit (PMU), Intelligent
24	3	Electronic Devices (IED)
25	**4**	**THEIR APPLICATION FOR MONITORING & PROTECTION.** Power Quality
26	4	Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid
27	4	Power Quality issues of Grid connected
28	4	Renewable Energy Sources
29	4	Power Quality Conditioners for Smart Grid
30	4	Web based Power Quality monitoring
31	4	Power Quality Audit.
32	5	**HIGH PERFORMANCE COMPUTING** For Smart Grid Applications:
33	**5**	Local Area Network
34	5	(LAN), House Area Network (HAN)
35	5	Wide Area Network (WAN)
36	5	Broadband over

37	5	Power line (BPL), IP based Protocols
38	5	Basics of Web Service
39	5	CLOUD Computing to make Smart
40	5	Grids smarter, Cyber Security for Smart Grid

TEXT/REFERENCE BOOKS

1 Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke: Smart Grid Technologies- Communication Technologies and Standards IEEE Transactions on Industrial Informatics, Vol. 7, No.

2 Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang: Smart Grid – The New and Improved Power Grid- A Survey, IEEE Transaction on Smart Grids

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Syllabus Deployment

Name of Faculty: Abrar Ahmed Subject Code:6EX4A
Subject Name: Advance Power Electronics
Department: Department of Electrical Engineering (EE& EEE) SEM: VI
Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1: Deduce the characteristics of Power Electronic switches with various parameters.

CO2: Study and analyze power electronic converters.

CO3: Simulate and analyze various power electronic circuits.

.

Lecture No.	Unit	Topic
1	**1**	**AC VOLTAGE CONTROLLERS**: Principle of On-Off Control
2	1	Principle of Phase control
3	1	Single Phase Bi-directional Controllers with Resistive Loads, Single Phase
4	1	Controllers with Inductive Loads, Three Phase full wave AC controllers, AC Voltage
5	1	Controller with PWM Control.
6	**2**	**CYCLO-CONVERTERS**: Basic principle of operation
7	2	Cyclo-converters: Basic principle of operation
8	2	Cyclo-converters: Basic principle of operation
9	2	Single phase to single phase
10	2	Three-phase to three-phase

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11	2	Three-phase to single phase cyclo-converters.
12	2	Output equation,
13	2	Control circuit.
14	**3**	**INVERTERS**: Principle of Operation
15	3	Single-phase bridge inverters.
16	3	Three phase bridge
17	3	Inverters: 180
18	3	120 degree of conduction.
19	3	VSI and CSI.
20	3	Voltage control of Single Phase
21	3	Three Phase Inverters
22	3	Harmonic analysis
23	3	Harmonic reduction techniques
24	3	Pulse width modulation techniques.
25	**4**	**RESONANT PULSE INVERTER:** Series resonant inverter
26	4	Series resonant inverter with unidirectional switches
27	4	Parallel resonant inverter
28	4	Class E resonant inverter
29	4	L-type
30	4	M-type ZCS resonant
31	4	Converter
32	4	ZVS resonant converter.
33	**5**	**POWER SUPPLIES**: Switched Mode DC Power Supplies
34	5	Fly-back converter, forward
35	5	Converter, half and full bridge converter
36	5	Resonant DC power supplies, bi-directional
37	5	Power supplies.
38	5	Resonant AC power supplies,
39	5	Bidirectional AC power supplies. Multistage
40	5	Conversions, Control Circuits

TEXT BOOK/REFERENCE BOOK

1. M. H. Rashid," Power electronics: circuits, devices, and applications", Pearson

Education India, 2009.
2. N. Mohan and T. M. Undeland," Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
3. R. W. Erickson and D. Maksimovic," Fundamentals of Power Electronics", Springer Science & Business Media, 2007.
4. L. Umanand," Power Electronics: Essentials and Applications", Wiley India, 2009

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Syllabus Deployment

Name of Faculty: Vivek Jain — Subject Code: 6EX6.3A

Subject: Digital Communication And Information Theory

Department: Department of Electrical Engineering (EE& EEE) — SEM: VI

Total No. of Lectures Planned: 40

COURSE OUTCOMES

At the end of this course students will be able to:

CO1:Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.

CO2:Perform the time and frequency domain analysis of the signals in a digital communication system.

CO3: Select the blocks in a design of digital communication system.

CO4: Analyze Performance of spread spectrum communication system

Lecture No.	Unit	Topic
1	**1**	**PCM & DELTA MODULATION SYSTEMS:** overview
2	1	PCM
3	1	Delta modulation
4	1	Quantization noise
5	1	PCM and delta modulation
6	1	Signal-to-noise ratio in PCM and delta modulation
7	1	T1 Carrier System, Comparison of PCM and DM. Adaptive delta Modulation. Bit
8	1	Word and frame synchronization, Matched filter detection.
9	**2**	**DIGITAL MODULATION TECHNIQUES:** overview
10	2	Various techniques of phase shift

11	2	Various techniques of phase shift
12	2	Amplitude shift
13	2	Frequency shift keying.
14	2	Minimum shift keying.
15	2	Modulation
16	2	Demodulation.
17	**3**	**ERROR PROBABILITY IN DIGITAL MODULATION:** overview
18	3	Error Probability in Digital Modulation
19	3	Calculation of error probabilities for
20	3	Calculation of error probabilities for
21	3	PSK
22	3	ASK
23	3	FSK
24	3	MSK techniques.
25	**4**	**INFORMATION THEORY:** Amount Of Information
26	4	Average Information, Entropy
27	4	Information rate, Increase in Average information per bit by coding
28	4	Shannon's Theorem
29	4	Shannon's bound
30	4	Capacity of a Gaussian Channel
31	4	BW-S/N trade off
32	4	Orthogonal signal transmission.
33	**5**	**CODING: CODING OF INFORMATION** overview
34	5	Coding: Coding of Information
35	5	Hamming code
36	5	Single Parity-Bit Code
37	5	Linear
38	5	Block code
39	5	Cyclic code
40	5	Convolution code

TEXT/REFERENCE BOOKS

1 R. N. Mutagi: Digital Communication, 2nd ed., Oxford. 2013
2 P. Ramakrishna Rao: Communication Systems, MGH.
3 H. Taub & D.L. Schilling: Principles of Communication Systems, MGH

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Lab Deployment

Name of Faculty: Dr. Vivek Jain Subject Code:6EX10A

Subject Name: Microprocesor& Microcontroller lab SEM: VI

Department: Department of Electrical and Electronics Engineering

Total No. of Labs Planned: 12

COURSE OUTCOMES

At the end of this course students will be able to:

CO1: To perform the microprograms like addition, subtraction etc.
CO2: To perform the Transfer a block of data from memory location XX00 to Another memory location XX00 in forward & reverse order.
CO3: Programing Peripheral Devices .

Labs No.	Name of Experiment
Following exercises are to be done in 8085 assembly language.	
1	Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
2	Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
3	Transfer of a block of data in memory to another place in memory in the direct and reverse order.
4	Searching a number in an array and finding its parity.
5	Sorting of array in: (i) Ascending (ii) Descending order
6	Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal
7	Programme to multiply two 8-bit numbers.
8	Programme to generate and sum 15 fibanocci numbers.

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9	Programme for rolling display of message "INDIAN".
10	To insert a number at correct place in a sorted array.
11	Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
12	Generation of different waveform on 8253/ 8254 programmable timer.

TEXT/REFERENCE BOOKS

1. Microprocessors Architecture, Programming &Application, Ramesh S. Gaonkar, (2000).
2. A Textbook of Microprocessors and Microcontrollers, R.S. Kaler I.K International Publishing House Pvt. Ltd.
3. Introduction to Microprocessors, A.P. Mathur, Mc Graw Hill.

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Syllabus Deployment

Name of Faculty: Mr. Abrar Ahmed Subject Code:6EX9A
Subject Name: Advance Power Electronics Lab
Department: Department of Electrical Engineering (EE & EEE) SEM: VI
Total No. of Lectures Planned: 12

Lab OUTCOMES

Atthe end of this course students will be able to:

CO1. Study and test AC voltage regulators using triac, antiparallel thyristors and triac&diac.

CO2. Study and test buck, boost and buck- boost regulators.

CO3. Study and test Zero voltage switching.

CO4. Study and test SCR DC circuit breaker.

CO5. Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.

CO6. Study speed control of dc motor using one, two and four quadrant choppers.

CO7. Study single-phase cyclo-converter.

Lab No.	Experiment /Objective
1	Study and test AC voltage regulators using triac, antiparallel thyristors and triac&diac.
2	Study and test single phase PWM inverter.
3	Study and test buck, boost and buck- boost regulators.
4	Study and test MOSFET chopper.
5	Study and test Zero voltage switching.
6	Study and test SCR DC circuit breaker.
7	Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.
8	Control speed of a single-phase induction motor using single phase AC voltage regulator.
9	(i) Study single-phase dual converter.(ii) Study speed control of dc motor using single-phase dual converter.
10	Study one, two and four quadrant choppers (DC-DC converters).
11	Study speed control of dc motor using one, two and four quadrant choppers.
12	Study single-phase cyclo-converter.

TEXT/REFERENCE BOOKS

1. Recent Developments in Power Electronics Book by Muhammad H. Rashid
2. Fundamentals of Power Electronics Book by Robert Warren Erickson

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Syllabus Deployment

Name of Faculty: Mr. CPJain Subject Code:6EX7A
Subject Name:Control System Lab
Department: Department of Electrical Engineering (EE & EEE) SEM: VI
Total No. of Lectures Planned: 11

Lab OUTCOMES

Atthe end of this course students will be able to:

CO1. Defining Systems in TF, ZPK form.

CO2. For a given 2ndorder system plot step response and obtain time response specification.

CO3. To design 1st order R-C circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse

CO4. Check for the stability of a given closed loop system.

Lab No.	Experiment /Objective
1	Introduction to MATLAB Computing Control Software.
2	Defining Systems in TF, ZPK form.

3	(a) Plot step response of a given TF and system in state-space. Take different values of damping ratioand wn natural undamped frequency. (b) Plot ramp response.
4	For a given 2ndorder system plot step response and obtain time response specification.
5	To design 1st order R-C circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse
6	To design 2nd order electrical network and study its transient response for step input and following cases. (a) Under damped system (b) Over damped System. (c) Critically damped system.
7	To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies.(a) Log Network(b) Lead (c) Log-lead Network.
8	To draw characteristics of ac servomotor
9	To perform experiment on Potentiometer error detector.
10	Check for the stability of a given closed loop system.
11	Plot bode plot for a 2ndorder system and find GM and PM.

TEXT/REFERENCE BOOKS

1. Control Systems Engineering Book by I.J. Nagrath and M. Gopal
2. Automatic Control Systems Book by Benjamin Kuo

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Syllabus Deployment

Name of Faculty: Mr. CPJain Subject Code: 6EX11A

Subject Name: Entrepreneurship development SEM: VI

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 6

Lab OUTCOMES

Atthe end of this course students will be able to:

CO1. Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement- motivation, leadership and entrepreneurial competencies.

CO2. Identification and selection of business opportunities and market survey, business plan. Implementation and customer satisfaction.

CO3. Business crises, problem-solving attitude, communication skill. Government policies for entrepreneurs.

CO4. Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation of Preliminary & Detailed project report.

Lab No.	Experiment /Objective
1	Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement-motivation, leadership and entrepreneurial competencies.

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2	Decision-making, procedures and formalities for starting own business, financial support system.
3	Identification and selection of business opportunities and market survey, business plan. Implementation and customer satisfaction.
4	Business crises, problem-solving attitude, communication skill. Government policies for entrepreneurs.
5	Knowledge based enterprises, Scope of entrepreneur in present context, area of future entrepreneurship.
6	Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation of Preliminary & Detailed project report

TEXT/REFERENCE BOOKS

1. Entrepreneurial Development Book by Khanka S.S.
2. Entrepreneurship Development and Small Business Enterprises Book by Poornima M. Charantimath

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Syllabus Deployment

Name of Faculty: Mr. Rajkumar Soni Subject Code:6EX8A

Subject Name: Power System Lab SEM: VI

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 9

Lab OUTCOMES

Atthe end of this course students will be able to:

CO1. Study the burden effect on the performance of CT and measure ratio error.

CO2. Find out the sequence components of currents in three 1-Phase transformers and 3-Phasetransformer and compare their results.

CO3. Study gas actuated Buchholz relay.

CO4. Study earthing of power station, substation and building

Lab No.	Experiment/Objective
1	Study the burden effect on the performance of CT and measure ratio error.
2	Find out the sequence components of currents in three 1-Phase transformers and 3-Phasetransformer and compare their results.
3	(i) Study over current relay.(ii) Draw the current-time characteristic of an over current relay for TMS=1 & 0.5

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	andPSM=1.25 & 1.0.
4	(i) Study percentage bias differential relay.(ii) Plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing.
5	Study gas actuated Buchholz relay.
6	Study under frequency relay and check it's setting experimentally.
7	Design a HV transmission line.
8	Study a typical grid substation.
9	Study earthing of power station, substation and building

TEXT/REFERENCE BOOKS

1. Modern Power System Analysis Book by D.P. Kothari and I.J. Nagrath
2. Power System Engineering Book by D.P. Kothari and I.J. Nagrath

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Syllabus Deployment

Name of Faculty: Gaurav Kumawat Subject Code:7EX6.3A
Subject Name: Operating System

Department: Department of Electrical Engineering (EE& EEE) SEM: VII
Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE (3 OUTCOMES)
At the end of this course students will be able to:
1 Understand and execute basic commands of shell script.
2 Apply basic operations in shell scripts which are required for different applications.
3 Identify and understand concept of file systems in shell script
4 Apply concept of creating new process from parent process.
5 Apply concept of OS to develop code on MAC OS

Lecture No.	Unit	Topic
1	**1**	**INTRODUCTION:** History
2	1	Operating system services
3	1	Types
4	1	Responsibilities
5	1	Generations
6		LINUX
7	1	WINDOWS
8	1	Process Management
9	**2**	**OPERATIONS ON PROCESS**: Overview
10	2	Process state
11	2	Scheduling
12	2	Criteria
13	2	Scheduling algorithms

14	2	Evaluation
15	2	Synchronization
16	2	Semaphores, Monitors
17	**3**	**MEMORY MANAGEMENT**: Overview
18	3	Swapping
19	3	Continuous memory allocation
20	3	Paging, Purepaging
21	3	Demand paging
22	3	Page-replacement algorithms
23	3	Thrashing, Example Pentium,
24	3	Disk Scheduling.
25	**4**	**INFORMATION MANAGEMENT**: Overview
26	4	File and directory concept
27	4	Access methods, Protection
28	4	Free space management
29	4	Efficiency and performance
30	4	Access matrix, Capability based
31	4	Systems, Program threats
32	4	User authentication
33	**5**	**FIREWALL.:** Overview
34	5	Dead Locks
35	5	System model
36	5	Dead lock characterization
37	5	Deadlock prevention
38	5	Avoidance
39	5	Detection
40	5	Recovery

TEXT/REFERENCE BOOKS

1 A. S. Tanenbaum: Modern Operating Systems, Pearson Education, Asia. 2014
2 D. M. Dhamdhere: Operating Systems- A Concept Based Approach 2/e, MGH
3 Achyut Godble: Operating Systems, MGH. 2011

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Syllabus Deployment

Name of Faculty: Mr. Chandra Prakash Jain
Subject Code:7EX2A
Subject Name:Power System Analysis
Department: Department of Electrical Engineering (EE& EEE)
SEM: VII
Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1 Develop an appropriate mathematical model of power system

CO 2 Carry out power flow analysis of practical power system for balanced system.

CO 3 Conduct studies during balanced faults to decide the fault levels and circuit breaker ratings.

CO 4 Conduct studies during unbalanced faults to decide the fault levels and circuit breaker ratings.

CO 5 Analyze the stability of single machine-infinite bus system and can decide the critical clearing time

Lecture No.	Unit	Topic
1	1	**PERCENT** and Per Unit Quantities.
2	1	Percent and per unit quantities.
3	1	Single line diagram for a balanced 3-phase system .
4	1	Single line diagram for a balanced 3-phase system
5	1	Admittance Model: Branch and node admittances Equivalent admittance network and calculation of Y bus..
6		Admittance Model: Branch and node admittances Equivalent admittance network and calculation of Y bus
7	1	Admittance Model: Branch and node admittances Equivalent admittance network and calculation of Y bus
8	1	Modification of an existing Y bus.

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9	**2**	**IMPENDENCE MODEL:** Bus admittance and impedance matrices
10	2	Thevenin's theorem and Z bus. Direct determination of Z bus.
11	2	Modification of an existing bus.
12	2	**Symmetrical fault Analysis:** Transient on a Transmission line
13	2	Short circuit of a synchronous machine on no load
14	2	Short circuit of a loaded synchronous machine. Equivalent circuits of synchronous machine under sub transient
15	2	Transient and steady state conditions. Selection of circuit breakers
16	2	Algorithm for short circuit studies. Analysis of three-phase faults
17	**3**	**SYMMETRICAL COMPONENTS:** Fortescue theorem
18	3	symmetrical component transformation
19	3	Phase shift in star-delta transformers. Sequence Impedances of transmission lines
20	3	Synchronous Machine and Transformers
21	3	Zero sequence network of transformers and transmission lines. Construction of sequence networks of power system
22	3	Fault analysis: analysis of single line to ground faults using symmetrical components
23	3	Fault Analysis: Analysis of single line to ground faults using symmetrical components,
24	3	Connection of sequence networks under the fault condition
25	**4**	**UNSYMMETRICAL FAULT ANALYSIS:** Overview
26	4	i) Analysis of line-to-line and double line to ground faults using symmetrical components
27	4	Connection of sequence networks under fault conditions.
28	4	Analysis of unsymmetrical shunt faults using bus impedance matrix method.
29	4	Analysis of unsymmetrical shunt faults using bus impedance matrix method.
30	4	Analysis of unsymmetrical shunt faults using bus impedance matrix method.
31	4	Analysis of unsymmetrical shunt faults using bus impedance matrix method.
32	4	Analysis of unsymmetrical shunt faults using bus impedance

		matrix method.
33	**5**	**LOAD FLOW ANALYSIS:** Load flow problem,
34	5	Load flow analysis: load flow problem,
35	5	Development of load flow equations,
36	5	Bus classification
37	5	Gauss Seidel
38	5	Newton Raphosn,
39	5	decoupled and fast decoupled methods for load flow analysis.
40	5	Comparison of load flow methods

TEXT/REFERENCE BOOKS

1.Chakraborti, A., Soni, M.L., Gupta, P.V. and Bhatnagar, U.S., A Text Book on Power System Engineering, Dhanpat Rai and Co. (P) Ltd. (2008).
2. J. J. Grainger and W. D. Stevenson: Power System Analysis, MGH.
3. B. R. Gupta: Power System Analysis and Design, Third Edition, S. Chand & Co.
4. Nagrath, I.J. and Kothari, D.P., Power System Engineering, Tata McGraw Hill (2007)
5. W. D. Stevenson: Element of Power System Analysis, MGH.

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SyllabusDeployment

Name of Faculty: Mr. RajkumarSoni Subject Code: 7EX5A

Subject Name: Power System Engineering SEM: VII

Department: Department of Electrical Engineering (EE& EEE)

Total no. of lectures planned: 46

COURSE OUTCOMES HERE

At the end of this course students will be able to

CO 1 :Able to explain System constraints, optimal operation of power systems.Economic distribution of load between power stations, unit commitment

CO 2:Able to perform calculation of Power angle equations, Power angle curves under steady state, transient conditions, Swing equation, steady state and dynamic stabilities.

CO 3 :Able to perform Equal area criterion calculation to calculate transient stability studies under basic disturbances with Critical clearing angle and Critical clearing time.

CO 4 :Able to understand the concept of Excitation system (AC and DC) and Interconnected powers systems (Reserve capacity of power stations, spinning and maintenance resaves)

CO 5 :Will be able to demonstrate and calculate related to Series compensation of transmission lines, Tap Changing Transformer, voltage stability and Power System Security.

Lecture No.	Unit	Topic
1	1	**ECONOMIC OPERATION OF POWER SYSTEMS:** Overview
2	1	Introduction, system constraints, optimal operation of power systems.
3	1	Input output, heat rate

4	1	Incremental rate curves of thermal generating units.
5	1	Economic distribution of load between generating units within a plant
6	1	Economic distribution of load between power stations
7	1	Transmission loss equation
8	1	Introduction to unit commitment
9	1	Dynamic programming
10	**2**	**POWER SYSTEM STABILITY-I:** Overview
11	2	Power angle equations
12	2	Power angle curves under steady state
13	2	Power angle curves under transient conditions.
14	2	Rotor dynamics
15	2	Swing equation (solution of swing equation not included).
16	2	Synchronizing power coefficient.
17	2	Introduction to steady state and dynamic stabilities
18	2	Steady state stability limit.
19	**3**	**POWER SYSTEM STABILITY-II:** Overview
20	3	Introduction to transient stability.
21	3	Equal area criterion
22	3	Application of Equal area criterion to transient stability studies under basic disturbances.
23	3	Critical clearing angle
24	3	Critical clearing time.
25	3	Factors affecting stability
26	3	Methods to improve stability.
27	**4**	**EXCITATION SYSTEMS:** Overview
28	4	Introduction of excitation systems of synchronous machines, types of excitation systems
29	4	Elements of various excitation systems and their control (functional block diagrams and their brief description)
30	4	DC excitation systems, AC excitation systems, brushless

		excitation system.
31	4	**Interconnected Power Systems** Introduction to isolated
32	4	Interconnected powers systems.
33	4	Reserve capacity of power stations, spinning and maintenance resaves.
34	4	Advantages and problems of interconnected power systems
35	4	Power systems inter connection in India
36	**5**	**TAP CHANGING TRANSFORMER**
37	5	Phase angle control
38	5	Phase shifting transformer
39	5	Series compensation of transmission lines
40	5	Location and protection of series capacitors
41	5	Series capacitors advantages and problems
42	5	Introduction to power system security
43	5	Introduction to voltage stability
44		Revision of course work
45		Revision of course work
46		Revision of course work

TEXT/REFERENCE BOOKS

1.J. Nagrath and D.P. Kothari: Power System Engineering 2/e, MGH.
2.J. J. Grainger and W. D. Stevenson: Power System Analysis, MGH.
3.B. R. Gupta: Power System Analysis and Design, Third Edition, S. Chand & Co.
4.C. L. Wadhwa: Electrical Power Systems, New age international Ltd. Third Edition
5.W. D. Stevenson: Element of Power System Analysis, MGH.

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Syllabus Deployment

Name of Faculty: Mr. Chandra Prakash Jain
Subject Code:7EX1A
Subject Name:Power System Planning

Department: Department of Electrical Engineering (EE& EEE)
SEM: VII
Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to:

CO 1 :Discuss primary components of power system planning, planning methodology for optimum power system expansion, various types of generation, transmission and distribution.

CO 2 :Show knowledge of forecasting of future load requirements of both demand and energy by deterministic and statistical techniques using forecasting tools.

CO 3 :Discuss methods to mobilize resources to meet the investment requirement for the power sector

CO 4 :Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions

Lecture No.	Unit	Topic
1	1	**INTRODUCTION OF POWER PLANNING**: Overview
2	1	National and Regional Planning
3	1	National and Regional Planning
4	1	Structure of planning tools
5	1	Electricity Regulation
6	1	Electrical Forecasting
7	1	Forecasting techniques modelling
8	1	Forecasting techniques modelling
9	2	**GENERATION PLANNING,** Overview

10	2	Integrated power generation cogeneration/captive power
11	2	Power pooling and power trading
12		Transmission and distribution planning
13	2	Power system Economics
14	2	Power sector finance, financial planning
15	2	Private participation
16	2	Rural Electrification investment, concept of Rational tariffs
17	**3**	**POWER SUPPLY RELIABILITY**, Overview
18	3	Reliability planning.
19	3	System operation planning
20	3	Load management, load prediction
21	3	Reactive power balance
22	3	Online power flow studies
23	3	State estimation
24	3	Computerized management, power system simulator.
25	**4**	**COMPUTER AIDED PLANNING**: Overview
26	4	Wheeling
27	4	Environmental effects
28	4	The greenhouse effect
29	4	The greenhouse effect
30	4	Technological impacts
31	4	Insulation coordination
32	4	Reactive compensation
33	**5**	**OPTIMAL POWER SYSTEM EXPANSION PLANNING :** Overview
34	5	Formulation of least cost
35	5	Optimization problem incorporating the capital
36	5	Operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.)
37	5	Operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.)
38	5	Operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.)
39	5	Operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.)
40	5	Minimum assured reliability constraint – optimization techniques

		for solution by programming

TEXT/REFERENCE BOOKS

1 X. Wang, J. R. Mc Donald: Modern Power System Planning, MGH.

2 Electric Power Planning, A. S. Pabla, McGraw Hill, 2nd Edition, 2016

3 A. S. Pabla: Electrical Power System Planning, Machmillan India Ltd

4 M. Tllic, F. Faliana and L. Fink: Power System Restructuring Engineering and Economics, Kulwar Academic Publisher.

5 L. L. Lie: Power System Restructuring and Deregulation, John Willey & Sons UK.

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Syllabus Deployment

Name of Faculty: Kirti dashora Subject Code:7EX3A
Subject Name: Artificial Intelligence Techniques
Department: Department of Electrical Engineering (EE& EEE) SEM: VII
Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:
CO1: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
CO3: Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
CO4: Demonstrate profciency developing applications in an 'AI language', expert system shell, or data mining tool.

Lecture No.	Unit	Topic
1	1	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE** Overview
2	1	Knowledge based Expert systems
3	1	Importance and Definition of AI
4	1	Introduction to ES

5	1	Es basics
6	1	ES building tools and shells
7	**2**	**KNOWLEDGE REPRESENTATION:** Overview
8	2	Concept of knowledge
9	2	Representation of knowledge using logics rules
10	2	Representation of knowledge using , frames
11	2	Procedural versus. Declarative knowledge, forward versus backward chaining
12	2	Control Strategies: Concept of heuristic search
13	2	Search techniques depth first search, Breath first search
14	2	Generate & test hill climbing
15	2	Best first search.
16	**3**	**ARTIFICIAL NEURAL NETWORK:** Overview
17	3	Biological Neurons and synapses
18	3	Characteristics Artificial Neural Networks
19	3	Types of activation functions
20	3	Perceptions: Perception representation
21	3	Limitations of perceptrons.
22	3	Single layer and multiplayer perceptrons
23	3	Perceptron learning algorithms
24	**4**	**BASIC CONCEPTS IN LEARNING ANN :** Overview
25	4	Supervised learning
26	4	Back propagation algorithm
27	4	Back propagation algorithm derivation
28	4	Unsupervised learning
29	4	Kohonen's top field network
30	4	Kohonen's top field network algorithm
31	**5**	**FUZZY LOGIC:** Overview
32	5	Fuzzy logic concepts
33	5	Fuzzy relation and membership functions
34	5	Defuzzification
35	5	Fuzzy controllers,
36	5	**Genetic Algorithm:** concepts
37	5	Coding, reproduction
38	5	Crossover, mutation
39	5	Scaling and fitness

40	5	Examples

TEXT/REFERENCE BOOKS

1 Saroj Kaushik: Artificial Intelligence, Cengage Learning. 2007
2 Elaine Rich and Kevin Knight: Artificial Intelligence 3/e, MGH
3 Padhy: Artificial Intelligence & Intelligent Systems, Oxford 2005
4 James Anderson: An introduction to Neural Networks. 1995
5 Dan. W Patterson: Artificial Intelligence and Expert Systems.

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Syllabus Deployment

Name of Faculty: Chandra Prakash Jain Subject Code:7EX6.2A
Subject Name: Computer Aided Design Of Electrical Machines
Department: Department of Electrical Engineering (EE& EEE) SEM: VII
Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:
CO 1: Understand general concepts of CAD
CO 2: Understand and implement CAD for Electrical Equipment
CO 3: Understand and implement CAD of DC Machine
CO 4: Understand and implement CAD of Transformer
CO 5: Understand and implement CAD of Three phase Induction Motor

Lecture No.	Unit	Topic
1	**1**	**BASIC PRINCIPLES OF ELECTRICAL MACHINE DESIGN:** Overview
2	1	Specifications, Factors affecting
3	1	The design, Limitations, main dimension, loadings, output equation, factor
4	1	Affecting the size and rating
5	1	Electrical Engineering Materials: conducting
6	1	Magnetic and insulating materials
7	1	Magnetic Circuit Calculation: Ohm's law for magnetic circuit, mmf required for air
8	1	Gap and iron parts, tapered teeth, real and apparent flux density, magnetizing current
9	**2**	**HEATING AND COOLING OF ELECTRICAL MACHINES**: Overview

10	2	Heat dissipation and heat flow
11	2	Equations, Newton's law of cooling
12	2	Equations for temperature rise
13	2	Rating of Machines: Continuous
14	2	Short and intermittent ratings, mean
15	2	Temperature rise, hydrogen cooling of turbo alternators
16	2	Quantity of cooling medium.
17	**3**	**COMPUTER AIDED DESIGN OF TRANSFORMERS**: Overview
18	3	Power and Distribution
19	3	Transformers
20	3	Core and yoke cross sections
21	3	Square and stepped core, output
22	3	Equations, main dimensions
23	3	Types & design of windings
24	3	Optimization concepts
25	**4**	**COMPUTER AIDED DESIGN OF SYNCHRONOUS MACHINES**: Overview
26	4	Turbo and Hydro alternators
27	4	Choice of specific magnetic & electric loading
28	4	Short circuit ratio and its effects
29	4	Air gap length, output equation
30	4	Main dimensions, flow charts for design
31	4	Synchronous machine
32	4	design of stator core & winding
33	**5**	**COMPUTER AIDED DESIGN OF INDUCTION MACHINES**: Overview
34	5	Output equation, main
35	5	Dimensions
36	5	Design criteria
37	5	Flow charts for design of induction motor
38	5	Air gap
39	5	Length, design of stator core and winding
40	5	Rotor design

TEXT BOOK /REFERENCE BOOK

1 A. K. Sawhney: A Course in Electrical Machine Design, Dhanpat Rai & Sons
2 B. Edikins: Generalized Theory of Electrical Machines
3 Fitzegerald: Electrical Machinery, Kingsley.
4 M. G. Say: The Performance and Design of AC Machines, Pitman & Sons
5 R. K. Agrawal: Electrical Machine Design

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Syllabus Deployment

Name of Faculty: Vivek Jain Subject Code:7EX6.1A
Subject Name: Digital Signal Processing
Department: Department of Electrical Engineering (EE& EEE) SEM: VII
Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:
CO1:Analyze different types of discrete signals and system properties.
CO2:Represent discrete systems in time and frequency domain using DFT with FFT algorithm.
CO3: Implementation and designing of IIR and FIR system using different methods.
CO4:Calculation of error Effect of Finite word length effect of registers of DSP processor.

Lecture No.	Unit	Topic
1	**1**	**SAMPLING:** Overview
2	1	Discrete time processing of Continuous-time signals
3	1	Discrete time processing of Continuous-time signals
4	1	Continuous-time processing of discrete-time signals
5	1	Continuous-time processing of discrete-time signals
6	1	Changing the sampling rate using discrete-time processing
7	1	Changing the sampling rate using discrete-time processing
8	1	Changing the sampling rate using discrete-time processing
9	**2**	**TRANSFORM ANALYSIS OF LTI SYSTEMS**: Overview
10	2	Introduction, The frequency response of LTI systems

11	2	System functions for systems characterized by LCCD (Linear Constant
12	2	Coefficient Difference) equations
13	2	All-pass system
14	2	Minimum Phase systems,
15	2	Linear
16	2	Systems with linear phase.
17	**3**	**STRUCTURES FOR DISCRETE-TIME SYSTEMS**: Overview
18	3	Structures for Discrete-Time Systems
19	3	Block diagram and signal flow graph
20	3	Block diagram and signal flow graph
21	3	Representation of LCCD (LCCD-Linear Constant Coefficient Difference) equations
22	3	Basic structures for IIR
23	3	FIR systems
24	3	Transposed forms
25	**4**	**FILTER DESIGN TECHNIQUES**: Overview
26	4	Introduction, Analog filter Design
27	4	Butterworth
28	4	Chebyshev.IIR filter design by impulse invariance
29	4	Bilinear transformation. Design
30	4	FIR filters by Windowing:
31	4	Rectangular, Hanning
32	4	Hamming & Kaiser
33	**5**	**THE DISCRETE FOURIER TRANSFORM (DFT)**: Overview
34	5	Properties of the DFT, Linear
35	5	Convolution using DFT
36	5	Efficient computation of the DFT
37	5	Decimation-in-Time and
38	5	Decimation-in frequency FFT Algorithms
39	5	Processing of speech signals: Vocoders
40	5	Linear predictive coders

TEXT/REFERENCE BOOKS

TEXT/REFERENCE BOOKS

1. Digital Signal Processing: Principals, Algorithms And Applications", Proakis, Manolakis,4th ed., Pearson Education.
2. Discrete Time Signal Processing, Oppenheim, Schafer, 3rd ed. , PHI (2010).
3. Digital Signal Processing, Sanjit K Mitra, 4th ed., TMH.

Digital Signal Processing:A Modern Introduction, Ambardar, Cengage learning

Techno India NJR Institute of Technology

Academic Administration of Techno NJR Institute

Syllabus Deployment

Name of Faculty: Mr. Chandra Prakash Jain Subject Code:7EX4A
Subject Name:Non Conventional Energy Source
Department: Department of Electrical Engineering (EE& EEE) SEM: VII
Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE
At the end of this course students will be able to:
CO 1 The concept of solar energy and their applications in different fields.
CO 2 The ways to harness energy from nonconventional energy sources like geothermal, wind and ocean.
CO 3 The ways of nuclear energy production and management of environmental problems due nuclear waste.
CO 4 The harmful effect of air, water and noise pollution on living things.

Lecture No.	Unit	Topic
1	1	**INTRODUCTION:** World energy situation,
2	1	Conventional and non-conventional energy
3	1	Sources, Indian energy scene.
4	1	Tidal Energy: Introduction to tidal power.
5	1	Components of tidal power plants, double
6		Basin arrangement. Power generation.
7	1	Advantages and limitations of tidal power
8	1	Generation. Prospects of tidal energy in India.
9	2	**SOLAR ENERGY**: Solar radiation, solar radiation geometry
10	2	Solar radiation on tilted
11	2	Surface. Solar energy collector. Flat- plate collector
12	2	Concentrating collector parabolic and heliostat

13	2	Solar pond. Basic solar power plant
14	2	Solar cell
15	2	Solar cell array
16	2	Basic photovoltaic power generating system
17	**3**	**WIND ENERGY:** Basic principle of wind energy conversion, efficiency of conversion
18	3	Site selection. Electric power generation-basic components, horizontal axis
19	3	Vertical axis wind turbines, towers, generators, control and monitoring components.
20	3	Basic electric generation schemes- constant speed constant frequency, variable speed
21	3	Constant frequency and variable speed variable frequency schemes. Applications of wind energy. Geothermal Energy: Geothermal fields, estimates of geothermal power
22	3	Geothermal steam power plant, binary fluid geothermal power plant and geothermal
23	3	Preheat hybrid power plant. Advantages and disadvantages of geothermal energy.
24	3	Applications of geothermal energy. Geothermal energy in India.
25	**4**	**NUCLEAR FUSION ENERGY**: Introduction
26	4	Nuclear fission and nuclear fusion
27	4	Requirements for nuclear fusion. Plasma confinement
28	4	Magnetic confinement and inertial confinement.
29	4	Basic Tokamak reactor
30	4	Laser fusion reactor.
31	4	Advantages of nuclear fusion.
32	4	Fusion hybrid and cold fusion.
33	**5**	**BIOMASS ENERGY**: Introduction, biomass categories
34	5	Bio-fuels. Introduction
35	5	Biomass conversion technologies.
36	5	Biogas generation, basic biogas plants-fixed dome type, floating gasholder type
37	5	Deen Bandhu biogas plant, Pragati design biogas plant.
38	5	Utilization of bio gas.
39	5	Energy plantation. Pyrolysis scheme.

40	5	Alternative liquid fuels ethanol and methanol. Ethanol production.

TEXT/REFERENCE BOOKS

1 G. D. Rao: Renewable Energy
2 B. H. Khan: Non-Conventional Energy Resources, MGH
3 A. N. Mathur: Non-Conventional Resources of Energy
4 Boyle: Renewable Energy, 3rded Oxford
5 Bent Sorensen, 4th ed.: Renewable Energy, Elsevier

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Syllabus Deployment

Name of Faculty: Mr. Rajkumar Soni Subject Code: 7EX8A

Subject Name: Power System Modeling and Simulation LAB SEM: VII

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 12

COURSE OUTCOMES HERE

Atthe end of this course students will be able to

1 Ability to Simulate Swing Equation in Simulink.

2 Ability toModeling of Synchronous Machine.

3 Modeling of Induction Machine.

4 Simulation of Synchronous Machine with FACTS device.

5 Ability to design an EHV transmission line.

6 Ability to FACTS Controller designs with FACT devices for SMIB system.

Lab No.	Topic
1	Simulate Swing Equation in Simulink (MATLAB)
2	Modeling of Synchronous Machine.
3	Modeling of Induction Machine.
4	Simulate simple circuits using Circuit Maker.
5	(a) Modeling of Synchronous Machine with PSS
6	(b) Simulation of Synchronous Machine with FACTS device.

7	(a) Modeling of Synchronous Machine with FACTS device
8	(b) Simulation of Synchronous Machine with FACTS devices.
9	FACTS Controller designs with FACT devices for SMIB system.
10	Revision of course work
11	Revision of course work
12	Revision of course work

TEXT/REFERENCE BOOKS

1. MATLAB and SIMULINK for Engineers (English, Paperback, TyagiAgam Kumar)
2. Understanding FACTS Book by Narain G. Hingorani
3. HVDC and FACTS Controllers: Applications of Static Converters in Power Systems Book by Vijay K. Sood

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Syllabus Deployment

Name of Faculty: Mr. Chandra Prakash Jain Subject Code: 7EX7A

Subject Name: Power system planning LAB SEM: VII

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 8

COURSE OUTCOMES HERE

Atthe end of this course students will be able to

1 Ability to Write components of Structure of power system.

2 Ability toExplain in detail various planning tools.

3 Modeling of Electrical Forecasting techniques.

4 Simulation of Synchronous Machine with FACTS device.

5 Ability to Transmission and distribution planning.

6 Ability to explain concept of Rational tariffs.

Lab No.	Topic
1	Status of National and Regional Planning, for power system
2	Write components of Structure of power system
3	Explain in detail various planning tools.
4	Write short note on Electricity Regulation
5	Modeling of Electrical Forecasting techniques

6	Transmission and distribution planning
7	Concept of Rational tariffs
8	Rural Electrification

TEXT/REFERENCE BOOKS

1. Electric Power System Planning: Issues, Algorithms and Solutions Book by Hossein Seifi and Mohammad SadeghSepasian
2. Power System Planning Book by R. L. Sullivan

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Syllabus Deployment

Name of Faculty: Mr. Chandra Prakash Jain Subject Code: 7EX9A

Subject Name: Industrial Economics and Management Lab SEM: VII

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 10

COURSE OUTCOMES HERE

Atthe end of this course students will be able to

1. Ability to express money Banking and Trade: Functions of money, supply & demand for money.

2. Ability toexplain sources of public revenue, principles of taxation, direct and indirect taxes, Theory of international trade.

3.Management Principles: Management functions, responsibilities of management to society, development of management though.

4.Production Management: Production planning and control, inventory control, quality control and Total quality management.

5. Ability to CPM, PERT, project information systems. Marketing functions, management of sales and advertising marketing research.

6. Ability to explain Finance and Account Management: Engineering Economics: Investment decision.

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

Lab No.	Topic
1	Money Banking and Trade: Functions of money, supply & demand for money, money price level & inflation, black money, meaning, magnitude & consequences. Functions of Commercial banks, banking system in India, shortcomings and improvements. Function of RBI, monetary policy-making, objectives and features.
2	Sources of public revenue, principles of taxation, direct and indirect taxes, Theory of international trade, balance of trade and payment, Foreign exchange control, devaluation New economic policy: Liberalization, extending privatization, globalization.
3	Management Principles: Management functions, responsibilities of management to society, development of management thought.
4	Nature of planning, decision making, management by objectives, Line and staff authority relationships, decentralization and delegation of authority, span of management.
5	Production Management: Production planning and control, inventory control, quality control and Total quality management. ISO standards Related to quality/Environment/safety etc. Tools of Project Management
6	CPM, PERT, project information systems. Marketing functions, management of sales and advertising marketing research.
7	Human Resource Management: Function, application of industrial psychology for selection, training and recruitment.
8	Communication process, media channels and barriers to effective communication, theories of motivation, leadership.
9	Finance and Account Management: Engineering Economics: Investment decision, present worth,annual worth and rate of return methods. Payback time.
10	Need for good cost accounting system, cost control techniques of

	financial control, financial statements, financial ratios, breakeven analysis, budgeting and budgetary control

TEXT/REFERENCE BOOKS

1. Industrial Economics & Management, 2/Ed. Book by S. P. Singh
2. Industrial Economics and Management Principles Book by Dr. Rajan Mishra

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Syllabus Deployment

Name of Faculty: Mr. Rajkumar Soni Subject Code: 8EX1A
Subject Name: EHV AC/DC
Department: Department of Electrical Engineering (EE& EEE) SEM: VIII
Total No. of Lectures Planned: 42

COURSE OUTCOMES HERE
Atthe end of this course students will be able to
CO 1 Qualitative comparison of AC and DC transmission system with all aspects
CO 2 Understand the need of EHV AC transmission and various issues related with it
CO 3 Reactive power management, Stability of AC and DC systems
CO 4 In depth converter analysis, faults, protections, harmonic considerations, grounding system
CO 5 Journey from conventional HVDC control to modern HVDC control schemes

Lecture No.	Unit	Topic
1	**1**	**EHV AC TRANSMISSION:** Need of EHV transmission lines
2	1	Power handling capacity and surge impedance loading
3	1	Problems of EHV transmission,
4	1	**Bundled Conductors:** geometric mean radius of bundle
5	1	Properties of bundleconductors
6	1	Electrostatic fields of EHV lines and their effects
7	1	Corona effects: Corona loss,
8	1	Audio and radio noise.
9	**2**	**LOAD FREQUENCY CONTROL:** Introduction to control of active and reactive power flow

10	2	Turbine speed governing system
11	2	Turbine speed governing system
12	2	Speed governing characteristic of generating unit and load sharing between parallel operating generators
13	2	**Method of Load Frequency Control:**overview
14	2	Flat frequency, flat tie line
15	2	Tie line load bias control
16	2	Automatic generation control (description of block diagram only)
17	**3**	**VOLTAGE CONTROL:** No load receiving end voltage
18	3	Reactive power generation.
19	3	Methods of voltage control
20	3	Synchronous phase modifier
21	3	Shunt capacitors and reactors
22	3	Saturable reactors, Thyristorised static VAR compensators
23	3	TCR, FC-TCR
24	3	TSC- TCR.
25	**4**	**FACTS:** Introduction
26	4	FACTS controllers,
27	4	Types of FACTS controllers
28	4	Brief description of STATCOM
29	4	Thyristor controlled series capacitors
30	4	Thyristor controlled series capacitors
31	4	Unified power flow controller
32	4	Unified power flow controller
33	**5**	**HVDC TRANSMISSION:** Types of D.C. links
34	5	HVDC Transmission: Types of D.C. links
35	5	Basic scheme and equipment of converter station.
36	5	Basic scheme and equipment of converter station. Ground return
37	5	Basic principles of DC link control
38	5	Basic converter control characteristics
39	5	Basic converter control characteristics
40	5	Application of HVDC transmission
41		Revision to course work.
42		Revision to course work.

TEXT/REFERENCE BOOKS

1 E. W. Kimbark: Direct Current Transmission, Vol. 1, Wiley Interscience

2 K. R. Padiyar: HVDC Power Transmission System, Wiley Eastern Ltd

3 K. R. Padiyar: HVDC Power Transmission Systems. NEW AGE PUB

4 J. Arrillaga: H.V.D.C Transmission, Peter Peregrines

5 J. Arrillaga HVDC Computer Modelling of Electrical Power System. John Wiley.

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Syllabus Deployment

Name of Faculty: Vivek Jain Subject Code: 8EX4.2A
Subject Name: Image Processing And Pattern Recognitions
Department: Department of Electrical Engineering (EE& EEE) SEM: VIII
Total No. of Lectures Planned: 40

COURSE OUTCOMES

Atthe end of this course students will be able to:

CO1:The basic concepts of two-dimensional signal acquisition, sampling, and quantization.

CO2: Spatial filtering techniques, including linear and nonlinear methods.

CO3: The Human Visual System (HVS) and its affect on image perception and understanding.

CO4: The fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.

Lecture No.	Unit	Topic
1	**1**	**INTRODUCTION:** Imaging
2	1	Imaging in ultraviolet and
3	1	Visible band. Fundamental steps in image
4	1	processing. Components in image processing.
5	1	Image perception in eye, light and
6	1	Electromagnetic spectrum,
7	1	Image sensing and acquisition using sensor array.
8	1	Digital Image Fundamentals:
9	**2**	**IMAGE SAMPLING AND QUANTIZATION,** Representing
10	2	Representing

11	2	Digital images,
12	2	Spatial and
13	2	Gray-level resolution,
14	2	Aliasing and Moiré patterns,
15	2	Zooming and Shrinking digital images.
16	2	Image Restoration: Image restoration model,
17	**3**	**NOISE MODELS, SPATIAL** : Frequency
18	3	Properties of noise,
19	3	Noise probability density functions.
20	3	Noise - only spatial filter,
21	3	Mean filter Statistic filter and adaptive filter, Frequency
22	3	Domain filters - Band reject filter,
23	3	Band pass filter and Notch filter.
24	3	Image Compression: Compression Fundamentals -
25	**4**	**CODING REDUNDANCY:** Inter pixel
26	4	Redundancy, Psycho visual redundancy and Fidelity criteria. Image Compression
27	4	Models, Source encoder and decoder.
28	4	Channel encoder and decoder,
29	4	Loss compression and compression standards. Color
30	4	Space formats, scaling methodologies (like horizontal, vertical up/down scaling).
31	4	Display format (VGA, NTSC, PAL).
32	4	Expert System and Pattern Recognition:
33	**5**	**USE OF COMPUTERS IN PROBLEM SOLVING,** Problem Solving
34	5	Information representation, searching, theorem proving, and
35	5	Pattern matching with substitution.
36	5	Methods for knowledge representation, searching, spatial, temporal and common
37	5	Sense reasoning, and logic and
38	5	Probabilistic inference.
39	5	Applications in Expert systems and robotics.
40	5	Applications in Expert systems and robotics

TEXT/REFERENCE BOOKS

1. Digital Signal and Image Processing, Tamal Bose,, 3rd ed. , JohnWiley,2005.
2. Image Processing, Analysis and Machine Vision, Sonaka, Hlavac and Boyle, 3rd ed. , Cengage Learning,2013.
3. Digital Image Processing, Pratt, 4th ed., John Wiley,2001.
4. Image Processing, Analysis, and Machine Vision, Sonka, cengage Learning,2006.

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Syllabus Deployment

Name of Faculty: Mr. RajkumarSoni Subject Code:8EX3A
Subject Name: Protection of Power System
Department: Department of Electrical Engineering (EE& EEE) SEM: VIII
Total No. of Lectures Planned: 52

COURSE OUTCOMES HERE
Atthe end of this course students will be able to
CO 1 :Introduction to protection, Trip circuit of a circuit breaker, CTs &PTs Current transformer, Steady state ratio and phase angle errors in CTs and PTs, CVT
CO 2:HRC fuse and thermal relay, different types of Overcurrent relays, Earth fault relay, Parallel feeders and ring mains.
CO 3:Generator Protection, Differential and percentage differential protection, Rotor protection-protection against excitation and prime mover failure, Field earth fault and unbalanced stator currents (negative sequence current protection).
CO 4 :Power Transformer protection, Percentage differential protection, Magnetizing inrush current, percentage differential relay with harmonic restrain, Buchholz relay, Bus bar Protection, High impedance relay scheme, frame leakage protection.
CO 5 :Transformer Line Protection: Construction, operating principle and characteristics of an electromagnetic impedance relay, Induction Motor Protection: Introduction to various faults and abnormal operating conditions, Earth fault and negative sequence voltage relays

Lecture No.	Unit	Topic
1	1	**CAUSES AND CONSEQUENCES OF DANGEROUS**

		CURRENTS
2	1	Faults, overloads and switching over currents
3	1	Introduction to protection
4	1	Trip circuit of a circuit breaker
5	1	Functional characteristics of a relay
6	1	Zone of protection
7	1	Primary and backup protection
8	1	**CTs &PTs**Current transformer
9	1	Current transformer construction
10	1	Measurement and protective CTs
11	1	Type of potential transformers
12	1	Steady state ratio and phase angle errors in CTs and PTs
13	1	Transient errors in CT and CVT (Capacitive Voltage Transformer).
14	**2**	**OVERCURRENT PROTECTION** HRC fuse
15	2	HRC fuse and thermal relay
16	2	Overcurrent relays – instantaneous, definite time
17	2	Inverse time and inverse definite minimum time overcurrent relays, time and current grading
18	2	Induction disc type relay
19	2	Directional overcurrent relay, 30, 60 and 90 degree connections.
20	2	Earth fault relay
21	2	Brief description of overcurrent protective schemes for a feeder
22	2	Parallel feeders and ring mains
23	**3**	**GENERATOR PROTECTION** Stator protection
24	3	Differential and percentage differential protection
25	3	Protection against stator inter-turn faults
26	3	Stator overheating protection
27	3	Rotor protection-protection against excitation and prime mover failure
28	3	Field earth fault and unbalanced stator currents (negative sequence current protection)
29	**4**	**TRANSFORMER PROTECTION :** Overview
30	4	Percentage differential protection
31	4	Magnetizing inrush current, percentage differential relay with harmonic restrain
32	4	Buchholz relay

33	4	Differential protection of generator transfer unit
34	4	Bus bar Protection
35	4	Differential protection of bus bars
36	4	High impedance relay scheme, frame leakage protection
37	**5**	**TRANSMISSION LINE PROTECTION**Introduction
38	5	Introduction to distance protection
39	5	Construction, operating principle and characteristics of an electromagnetic impedance relay
40	5	Effect of arc resistance
41	5	Induction cup type reactance and mho relays
42	5	Comparison between impedance, reactance and mho relays
43	5	Three stepped distance protection of transmission line.
44	5	Induction Motor Protection
45	5	Introduction to various faults and abnormal operating conditions
46	5	Unbalance supply voltage and single phasing
47	5	Introduction to protection of induction motors- HRC fuse and overcurrent
48	5	Percentage differential
49	5	Earth fault and negative sequence voltage relays
50		Revision to course work.
51		Revision to course work.
52		Revision to course work.

TEXT/REFERENCE BOOKS

1 Badri Ram: Power System Protection and Switchgear, MGH.

2 RavindraNath M. Chander: Power System Protection and Switch Gear, John Wiley Eastern.

3 Sunil S. Rao.: Power System Protection and Switch Gear, Khanna Publishers.

4 Oza: Power System Protection and Switchgear, MGH.

5 T. S. Madhava Rao: Power System Protections (Static Relays), MGH.

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Syllabus Deployment

Name of Faculty: Mr. Chandra Prakash Jain Subject Code:8EX4.1A
Subject Name: Utilization of Electrical Power
Department: Department of Electrical Engineering (EE& EEE) SEM: VIII
Total No. of Lectures Planned: 42

COURSE OUTCOMES HERE
At the end of this course students will be able to
CO 1:Illustrate Working Principle Electric Power Utilization And Their Application In Real Life.
CO 2 :Choose Proper Traction Systems Depending Upon Application Considering Economic And
CO 3 :Technology Up-Gradation.
CO 4 :Traction System; Analyze The Performance Parameter Of The Traction System.

Lecture No.	Unit	Topic
1	1	**ELECTRIC HEATING**: Different methods of electric heating
2	1	Principle of high frequency induction and dielectric heating
3	1	Construction, operation, performance and applications of arc furnace and induction furnace
4	1	Electric Welding: Welding process, welding transformer
5	1	Classification of Electric Welding: arc welding,
6	1	Resistance welding
7	1	Welding of various metals
8	1	Numerical Electric Heating
9	1	Numerical Electric Welding
10	2	**ILLUMINATION**s: Definitions, laws of illuminations

11	2	Polar curves, luminous efficiency
12	2	Photometer, incandescent lamps
13	2	Filament materials, Halogen lamp
14	2	Electric discharge lamps, sodium vapour lamp,
15	2	Mercury vapour lamp and fluorescent lamp. Light Calculations:
16	2	Commercial, industrial, street and flood lighting.
17	2	Numerical Light
18	2	Numerical Light Calculations
19	**3**	**ELECTROLYTIC PROCESS:** Principles And Applications Of Electrolysis,
20	3	Electro-deposition, Manufactures of chemicals,
21	3	Anodizing, electro-polishing , electro-cleaning, electroextraction
22	3	Electro-refining
23	3	Electro-stripping (parting) power supplies for electrolytic process
24	**4**	**ELECTRIC TRACTION & MEANS OF SUPPLYING POWER**: Systems of Electric Traction:
25	4	DC & AC Systems, Power Supply for Electric Traction System
26	4	Comparison and application of different systems
27	4	Sub-station equipment and layout, conductor rail & pantograph
28	4	Numerical
29	**5**	**TRACTION METHODS**: Types of services,
30	5	Speed time and speed distance curves,
31	5	Numerical
32	5	Numerical
33	5	Estimation of power and energy requirements, Mechanics of train movement
34	5	Numerical
35	5	Co-efficient of adhesion, Adhesive weight, effective weight. Traction Motor Controls:
36	5	DC and AC traction motors
37	5	Series parallel starting. Methods of electric braking of traction motors.
38		Revision to course work.
39		Revision to course work.
40		Revision to course work.

TEXT/REFERENCE BOOKS

1 C. L. Wadhwa: Utilization of Electric Traction Electric Power.
2 H. Partab: Art and Science of Electrical Energy, Dhanpat Rai & Sons
3 H. Partab:Modern Electric Traction, Dhanpat Rai & Sons

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Syllabus Deployment

Name of Faculty: Vivek Jain Subject Code: 8EX4.3A
Subject Name: VHDL

Department: Department of Electrical Engineering (EE& EEE) SEM: VIII

Total No. of Lectures Planned: 40

COURSE OUTCOMES HERE

At the end of this course students will be able to

1. Develop a digital logic and apply it to solve real life problems.
2. Analyze, design and implement combinational logic circuits.
3. Classify different semiconductor memories.
4. Analyze, design and implement sequential logic circuits.
5. Analyze digital system design using PLD.
6. Simulate and implement combinational and sequential circuits using VHDL systems.

Lecture No.	Unit	Topic
1	**1**	**INTRODUCTION:** Fundamental
2	1	Fundamental
3	1	History of various hardware
4	1	History of various hardware
5	1	Description language,
6	1	Design flow of ASICs and
7	1	Sstandard logic circuits using software.
8	1	Standard logic circuits using software
9	**2**	**COMBINATIONAL CIRCUIT BUILDING BLOCKS:** overview
10	2	Multiplexer
11	2	Decoders

12	2	Encoders
13	2	Code
14	2	Converters
15	2	VHDL Code for
16	2	Combinational Circuits.
17	**3**	**SEQUENTIAL CIRCUITS:** overview
18	3	Sequential Circuits:
19	3	VHDL code for Flip-Flops
20	3	VHDL code for Flip-Flops
21	3	VHDL code for Flip-Flops
22	3	Shift registers
23	3	Shift registers
24	3	Counters.
25	**4**	**SYNCHRONOUS/ASYNCHRONOUS** Sequential Circuits:
26	4	Mealy & Moore type FSMs,
27	4	VHDL Code for Mealy & Moore Machines
28	4	VHDL Code for Mealy & Moore Machines
29	4	VHDL Code for Mealy & Moore Machines
30	4	VHDL Codes for Serial Adder
31	4	VHDL Codes for Serial Adder
32	4	Vending Machine.
33	**5**	**DIGITAL SYSTEM DESIGN:** Building Block circuits
34	5	Building Block circuits
35	5	Memory organization
36	5	SRAM
37	5	Design examples of divider
38	5	Multiplier, Shifting & Sorting Operations
39	5	Clock
40	5	Synchronization, CPU organization and design concepts.

TEXT/REFERENCE BOOKS

1 Stephen Brown and Zvonki Vranesic: Fundamentals of Digital Logic circuit VHDL Design 2/e, MGH. 2008
2 Z. Navabi: Analysis and Modeling of Digital Systems, MGH
3. D. L. Perry: VHDL, 3rd ed., MGH.

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Syllabus Deployment

Name of Faculty: Mr. Chandra Prakash Jain Subject Code: 8EX2A
Subject Name: Electric Drives And Their Control
Department: Department of Electrical Engineering (EE& EEE) SEM: VIII
Total No. of Lectures Planned: 42

COURSE OUTCOMES HERE
At the end of this course students will be able to
CO 1 :Classify Electrical Drives, And Justify Multi-Quadrant Operation Of Drives
CO 2 :Along With Load Equalization
CO 3 :Analyze The Thermal Model And Determine The Motor Rating For Different
CO 4 :Duty Cycles Considering The Effect Of Load Inertia And Environmental
CO 5:Identify Suitable Form Of Electrical Drives System In Industry

Lecture No.	Unit	Topic
1	**1**	**DYNAMICS OF ELECTRIC DRIVES:** Introduction
2	1	Fundamental torque equations
3	1	Speed-torque conventions
4	1	Multi-quadrant operation,
5	1	Nature and classification of load torques,
6	1	Steady state stability,
7	1	Load equalization
8	1	Close loop configurations of drives.
9	**2**	**DC DRIVES:** Speed Torque Curves
10	2	Torque and power limitation in armature voltage and field control,

11	2	Torque and power limitation in armature voltage and field control,
12	2	Starting, Braking
13	2	Regenerative Braking, dynamic braking and plugging
14	2	Speed Control-Controlled Rectifier fed DC drives,
15	2	Speed Control-Controlled Rectifier fed DC drives,
16	2	Chopper Controlled DC drives.
17	**3**	**INDUCTION MOTOR DRIVES-I :** Induction Motor Drives
18	3	Starting, Braking-Regenerative braking,
19	3	Starting, Braking-Regenerative braking,
20	3	Plugging and dynamic braking
21	3	Speed Control: Stator voltage control
22	3	Variable frequency control from voltage source,
23	3	Variable frequency control from voltage source,
24	3	Voltage Source Inverter (VSI) Control
25	**4**	**INDUCTION MOTOR DRIVES-II :** overview
26	4	Variable frequency control from current source,
27	4	Variable frequency control from current source,
28	4	Current Source Inverter (CSI) Control,
29	4	Cycloconverter Control
30	4	Static rotor resistance control
31	4	Slip Power Recovery
32	4	Stator Scherbius drive, Static Kramer drive.
33	**5**	**SYNCHRONOUS MOTOR DRIVE** Synchronous Motor Drive
34	5	Control of Synchronous Motor-Separately Controlled
35	5	Control of Synchronous Motor-Separately Controlled
36	5	VSI fed Self-Controlled Synchronous Motor Drives.
37	5	VSI fed Self-Controlled Synchronous Motor Drives.
38	5	Dynamic and Regenerative Braking of Synchronous Motor with VSI
39	5	Dynamic and Regenerative Braking of Synchronous Motor with VSI
40	5	Control of Synchronous Motor Using Current Source Inverter (CSI).
41		Revision to course work.
42		Revision to course work.

TEXT/REFERENCE BOOKS

1 G. K. Dubey: Fundamentals of Electrical Drives, Narosa Publishing House, New Delhi.

2 B. K. Bose: Power Electronics and Motor Drives, Elsevier

3 V. Subrahmanyam: Electric Drives- Concepts and Applications, MGH

4 Theodore Wildi: Electrical Machines, Drives and Power Systems, Pearson

5 S. K. Pillai: A First Course on Electrical Drives, Wiley Eastern limited, India

Techno India NJR Institute of Technology

Academic Administration of Techno NJR Institute

Syllabus Deployment

Name of Faculty: Mr. Rajkumar Soni Subject Code:8EX6A

Subject Name:Electrical Drives and Control Lab SEM: VIII

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 12

COURSE OUTCOMES HERE

Atthe end of this course students will be able to:

CO1: Study and test the firing circuit of three phase half controlled bridge converter.

CO2: Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads.

CO3: Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.

CO4: Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter

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Lab No.	Experiment
1	Study and test the firing circuit of three phase half controlled bridge converter.
2	Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads.
3	Study and test the firing circuit of 3-phase full controlled bridge converter.
4	Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads.
5	Study and test 3-phase AC voltage regulator.
6	Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.
7	Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.
8	Control speed of universal motor using AC voltage regulator.
9	Study 3-phase dual converter.
10	Study speed control of dc motor using 3-phase dual converter.
11	Study three-phase cyclo-converter and speed control of synchronous motor using cyclo-converter.
12	Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter

TEXT/REFERENCE BOOKS

1. Fundamentals of Electrical Drives (English, Paperback, Dubey Gopal K.)
2. Fundamentals of Electric Drives and Control B.R.Gupta&V.Singhal.

Techno India NJR Institute of Technology

Academic Administration of Techno NJR Institute

Syllabus Deployment

Name of Faculty: Mr. Rajkumar Soni Subject Code:8EX5A

Subject Name:Computer Based Power System Lab SEM: VIII

Department: Department of Electrical Engineering (EE & EEE)

Total no. of Labs planned: 9

COURSE OUTCOMES HERE

Atthe end of this course students will be able to:

CO1: Fault analysis (for 3 to 6 bus) and verify the results using MATLAB: (i) LG Fault (ii) LLG Fault

CO2: Load flow analysis for a given system (for 3 to 6 bus) using (i) Gauss Seidal (ii) Newton Raphson

CO3: Study of overload security analysis and obtain results for the given probler using MATLAB or any software

Lab No.	Experiment
1	Fault analysis (for 3 to 6 bus) and verify the results using MATLAB or any available software for the cases: (i) LG Fault (ii) LLG Fault
2	Fault analysis (for 3 to 6 bus) and verify the results using MATLAB or any available software for the cases: LL Fault and
3	Fault analysis (for 3 to 6 bus) and verify the results using

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	MATLAB or any available software for the cases: 3-Phase Fault
4	Load flow analysis for a given system (for 3 to 6 bus) using (i) Gauss-Seidal (ii) Newton Raphson
5	Fast Decoupled Method and verify results using MATLAB or any
6	Study of voltage security analysis
7	Study of overload security analysis and obtain results for the given problem using MATLAB or any software.
8	.Study of economic load dispatch problem with different methods
9	Study of transient stability analysis using MATLAB/ETAP Software

TEXT/REFERENCE BOOKS

1. Power System Engineering Book by D.P. Kothari and I.J. Nagrath
2. Power System Engineering: Planning, Design, and Operation of Power Systems and Equipment Book by Jürgen Schlabbach and Karl-Heinz Rofalski.
3. Power Systems Analysis Illustrated With Matlab And Etap 2019 Edition by SHERTUKDE H M, TAYLOR & FRANCIS LTD