Basaveshwar Engineering College (Autonomous)
[TEQIP Lead Institute, Govt. Aided Institution, AICTE Recognized, Affiliated to VTU Belgaum]
Bagalkot-587103, Karnataka, India.

Department of Electrical and Electronics Engineering

FIELD THEORY

Subject Code : UEE551C | **SEE Marks : 100**
Credits : 03 (2-2-0) | **Exam Duration: 03 Hours**

Unit-I

01 Review of Vector Analysis: L-07 Hours, T-06 Hours

Introduction to Scalars and vectors

02 Coulomb's Law and Electric Field Intensity:

Experimental law of Coulomb, electric field intensity, field due to continuous volume charge distribution, field of a line charge, field of a sheet charge.

03 Electric Flux Density, Gauss' Law and Divergence:

Electric Flux Density, Gauss' Law, Divergence. Maxwell's first equation (Electrostatics), vector operator V and the divergence theorem.

Unit – II

04 Energy and Potential: L-06 Hours, T-07 Hours

Energy expended in moving a point charge in an electric filed, the line integral, definition of potential difference and potential. The potential field of a point charge and system of charges, potential gradient, the dipole.

05 Conductors, Dielectrics and Capacitance:

Current and current density, Continuity of current, metallic conductors, Conductor properties and Boundary conditions, capacitance.

Unit – III

06 The Steady Magnetic Field: L-07 Hours, T-06 Hours

Biot-Savart law, Ampere's circuital law, Curl, Stokes' theorem, magnetic flux and flux density.

07 Magnetic Forces:

Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit.

Unit – IV

08 Materials and Inductance: L-06 Hours, T-07 Hours

The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit.

09 Time Varying Fields and Maxwell's Equations:

Faraday's law, displacement current, Maxwell's equation in point and Integral form.

Course outcomes: At the end of the course,

- Students should be able to state concept of gradient, divergence and curl of a vector in various systems
- Students should be able to illustrate the Gauss' law, potential energy, and divergence in different applications
- Students should be able to apply different coordinate systems for electromagnetic field computations
- Students should be able to analyze different coordinate systems in electromagnetic field applications

- Students should be able to compare and contrast electric field & magnetic field in different applications
- Students should be able to combine and revise various properties of electromagnetic field applications by multiple methods.

TEXT BOOKS:

01 William H Hayt Jr. and John A Buck, "Engineering Electromagnetics", 17th - edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

01 John Karuss and Daniel A Fleisch, "Electromagnetics with Applications" V-edition McGraw-Hill,1999.

02 Edward C. Jordan and Keith G Balmain, "Electromagnetic Waves and Radiating Systems," II- edition, Prentice Hall of India / Pearson Education, 1968. Reprint 2002.

03 David K Cheng, "Field and Wave Electromagnetics", II- edition, Pearson Education Asia, - 1989, Indian Reprint – 2015.

04 Matthew N.O. Sadiku, Elements of Electromagnetics, 6th -Edition, Oxford University Press, 2000.

05 Dr. D. Ganesh Rao, " Field Theory" Sanguine Technical Publishers, 1st Edition, 2014.

QUESTION PAPER PATERN FOR SEE:

01 Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.

02 Each Question should not have more than four sub divisions.

03 Any Five Full questions are to be answered choosing at least one from each unit.

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Department of Electrical and Electronics Engineering

DIGITAL SIGNAL PROCESSING

Subject Code:	**UEE552C**	**SEE Marks:**	**100**
Credits:	**3 (2-1-0) (Theory 26 hrs, Tutorial 26 hrs)**	**Exam Duration:**	**03 Hrs**

	Lecture-Theory 2 Credits (13 x 2=26 Hrs)	No. of Lecture Hours	Tutorial-Numerical 1 Credit (13 x 2=26 Hrs)	No. of Tutorial Hours
	UNIT - I (8 Hrs)		**UNIT - I (5 Hrs)**	
01	**Discrete Fourier Transform** Introduction, Definition, and derivation of DFT and IDFT , Properties-linearity, shift, Symmetry etc., circular convolution, periodic convolution, use of tabular arrays, circular arrays, Stock Ham's methods, Linear convolution-two finite duration sequences, One finite and one infinite duration –overlap add method	**08**	• Verification of DFT-IDFT properties through numerical, • Assessment of output of a system in frequency domain using different properties of DFT-IDFT • To assess the output of a system for long duration input sequences	**05**
	UNIT II (8 Hrs)		**UNIT II (5 Hrs)**	
02	**Fast Fourier Transform Algorithms** Introduction, decimation in time algorithm (DIT-FFT, DIT-IFFT), First decomposition, Continuation of decomposition, number of computations, number of multiplications, Computational efficiency,	**04**	• Developing N-point DIT-FFT, DIT-IFFT algorithms, • Drawing the 8-point FFT signal flow graphs • Comparing number of calculations for direct DFT and FFT algorithms	**03**
03	**Design of FIR Digital filters** Introduction, Windowing, rectangular, Hamming window,	**04**	• Designing FIR filters for given specifications • Verification of filter design • Sketching of Filter output	**02**
	UNIT III (8 Hrs)		**UNIT III (5 Hrs)**	
04	**Design of IIR Digital filters** Introduction, all pole analog filters-Butterworth and Chebyshev, Design of analog filters, Bilinear Transformation, Design of digital Butterworth and Chebyshev filters, Frequency transformations	**06**	• Designing IIR filters for given specifications • Verification of filter design • Sketching of Filter output • Design of analog filter and Conversion of Analog filter to digital filters	**07**
	UNIT IV (8 Hrs)		**UNIT IV (5 Hrs)**	

05	**Realization of Digital Systems** Introduction, block diagrams and SFG's, Realization of IIR systems-direct form, cascade form, Parallel form, Realization of FIR systems-direct form, cascade form, Linear phase realizations	**05**	• Obtaining difference equation of IIR and FIR filter. • Realizing the systems in direct form, cascade form, parallel form • Realization of linear phase FIR filters	**05**
06	**DSP Processors TMS320** Architecture and electrical applications (block diagram approach)	**03**		

Course Outcomes:

At the end of the course the student should be able to:

1	Recall DFT, IDFT, and basic properties of DSP
2	Classify the FFT algorithms, filters, and design methods
3	Derive DFT properties, FFT algorithms, filter equations, and convolution output
4	Assess the output of system by linear & circular convolution, Stockhams method, and FFT algorithms
5	Implement/realize the discrete LTI system in direct form I & II, cascade and parallel forms
6	Design a filter for the given specifications.

Reference Books :

01	Digital Signal Processing Principle,algorithms and applications 4th edition by Proakis, Pearson Education 2012
02	Digital Signal Processing by Sanjith K. Mithra Edition, 2013
03	Digital Signal Processing by Oppenheim, Pearson Education / PHI, 2015
04	Digital Signal Processing by Salivatanam, A Vallavaraj, Gnanapriya , TMH 2011
05	Digital Signal Processing by Ifeachor Emmauel, Pearson Education, 2nd edition 2010

Question Paper Pattern for SEE:

1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions
3. Any Five Full questions are to be answered choosing at least one from each unit.

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Department of Electrical and Electronics Engineering

Control System

Subject Code: UEE553C **Credits: 03**
Contact Hours: 03 (2L - 2T - 0P) **Assessment: CIE 50 and SEE 50**

Unit-I

01 Introduction and Transfer function of Systems: L- 06 Hrs

Classification of control systems, open loop and closed loop systems, effects of feedback, Mathematical models of physical systems; definition of transfer function, Mechanical systems, Translational systems, Rotational systems, Electrical systems, Analogous systems.

02 Block Diagrams and Signal Flow Graphs: L- 05Hrs

Block diagrams (BD), Reduction of BD, Signal Flow graphs (SFG), Drawing block diagram and SFG of simple networks Mason's gain formula, Converting BD into SFG.

Unit-II

03 Time Response of Feed Back Control Systems: L-06 Hrs

Standard test signals, Unit step response of First and second order systems, time response specifications, and Time response specifications of second order systems, steady state errors and error constants.

04 Stability Analysis: L- 03 Hrs

Concepts of stability, Necessary conditions for Stability, Routh's stability criterion.

Unit-III

05 Root–Locus Techniques L-03 Hrs

Root locus concepts, Construction of root loci.

06 Introduction to State Variable Analysis: **L- 06 Hrs**

Concepts of state, state variables and state model, state models for linear continuous time systems, conversion of state model to transfer function and transfer function to state model, solution of state equations,

Unit-IV

07 Frequency Domain Analysis: L- 07 Hrs

Introduction, frequency domain specifications, correlation between time and frequency response. Method to draw bode plot, phase margin, gain margin, stability considerations,

08 Nyquist stability criterion. L- 03 Hrs

References:

1. 'Norman S Nise' “Control System Engineering ” McGraw Hill,
2. Benjamin C Kuo, “Automatic Control System”, VII- Edition, PHI, 2010.

3. Richard C. Dorf Robert H Bishop "Modern Control Systems ",VII- Edition, Addison Wesley.

Course outcomes:

After completion of the course, the students shall be able to:

1. Illustrate the control System concept and its types.
2. Analyze the transfer function modeling of systems and its parameters
3. Explain the concept of time response and order of the system.
4. State the various concept of stability.
5. Compare and contrast the various frequency response plots.
6. Apply the State space modeling and solution of state equations

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Generation Transmission and Distribution

Subject Code:	UEE554E	Credits:	03
Contact Hours:	03 (3L - 0T - 0P)	Assessment:	CIE 50 and SEE 50

Unit-I

Electrical Power Generation: **03 Hrs**

Hydro Power Generation: Site selection, Line diagram representation, Classification, Merits and Demerits. Thermal Power Generation: Site selection, Line diagram representation, Classification, Merits and Demerits. Nuclear Power Generation: Site selection, Line diagram representation, Classification, Merits and Demerits.

Basic Aspects of Power Generation: **07 Hrs**

Introduction, Load curve and load duration curve. Terms commonly used in system operation: Load factor, Diversity factor, Demand factor, plant capacity factor, plant utilization factor, Installed capacity, reserve capacity, Cold reserve, hot reserve, Spinning reserve, firm power. Effect of diversity factor on cost of generation. Interconnection of power stations, transfer of power. Economic Loading of interconnected stations.

Unit-II

AC Transmission Systems: **08 Hrs**

Typical AC transmission system, Advantages of high voltage transmission. Comparison of conductor material in overhead lines: 3 phase 3 wire system, 3 phase 4 wire system. Components of overhead transmission line: Conductors, Line supports, Insulators – Types, Potential distribution over suspension insulator string, String efficiency, Methods of improving string efficiency. Corona – Factors affecting corona, Imp terms, Methods of reducing corona. Sag in overhead lines- Calculation of sag for equal and unequal supports, Effect of wind and ice loading on sag.

Electrical Parameters of Overhead Transmission Lines: **02 Hrs**

Constants of Transmission line. Inductance of single phase two wire line, Capacitance of single phase two wire line.

Unit-III

Performance of Transmission Lines: **05 Hrs**

Classification of overhead Transmission line. Short Transmission line, Medium Transmission line – End condenser method, Nominal T method, Nominal π method, Long Transmission line. Generalised circuit constants (ABCD) of a transmission line.

Underground Cables: **05 Hrs**

Construction of underground cables, Insulating materials for underground cables, Laying of underground cables. Insulation resistance of single core cable, Capacitance of single core cable, Dielectric stress in a single core cable. Grading of cables: Capacitance grading, Intersheath grading.

Unit-IV

Distribution Systems: **04 Hrs**

Classification of distribution systems. Overhead Vs Underground distribution system. Connection schemes of distribution system. Requirements of a distribution system.

DC Distribution: **04 Hrs**

Types of DC distributors, DC distributor fed at one end- Concentrated loading, Uniform loading. DC distributor fed at both ends - Concentrated loading.

AC Distribution: **02 Hrs**

AC distribution calculation, Methods of solving AC distribution issues.

Textbooks:

1. Soni, Gupta and Bhatnagar, “Power System Engineering”, 5th edition, Dhanapat Rai and Co.(P) Ltd.

Publishers, New Delhi, 2016.
2. Mehta V K and Rohit Mehta, " Principals of Power Systems", 4th edition, S Chand and Company Ltd, Publishers, New Delhi, 2015.

References:

1. Gupta J B, "Transmission and Distribution of Electrical power", 9th edition, Sanjeev jumar Kataria Publishers, New Delhi, 2012.
2. Wadhwa C L, "Generation, Distribution and Utilization of Electrical Power", 3rd edition, New age International(p) Ltd., New Delhi, 2012.

Course outcomes:

After completion of the course,

- Students shall be able to **list and define** various parameters and features of Electrical power generation, transmission and distribution.
- Students shall be able to **explain** different mechanical and electrical parameters related to Electrical power generation, transmission and distribution.
- Students shall be able to **relate/articulate** the concepts and theories related to electrical parameters of Electrical power generation, transmission and distribution.
- Students shall be able to **compare and contrast** the features of Electrical power generation, transmission and distribution.
- Students shall be able to **evaluate/calculate** various parameters related to Electrical power generation, transmission and distribution.
- Students shall be able to **discuss/choose/test** issues relating to Electrical power generation, transmission and distribution.

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ELECTRICAL MACHINE DESIGN

Subject Code: UEE557E **Credits: 03**
Contact Hours: 03 (3L-0T-0P) **Assessment: CIE 50 and SEE 50**

Unit-I

Principles of Electrical Machine Design: L-04 Hours

Introduction to design of electrical machines, limitations. Different types of materials and insulators used in electrical machines.

Design of DC Machines: L-06 Hours

Output equation, choice of specific loadings and number of poles, design of main dimensions, armature slot dimensions, commutators, brushes, and magnetic circuit – estimation of ampere turns, yoke, pole and field windings (shunt, series and inter poles).

Unit-II

Design of Transformers (Single phase and three phase): L-10 Hours

Output equation for single phase and three phase transformer, choice of specific loadings, expression for volts/turn , determination of main dimensions of the core, types of windings and estimation of number of turns and cross sectional area of Primary and secondary coils, estimation of no load current , expression for leakage reactance. Design of tank and cooling tube.

Unit-III

Design of Induction Motors : L-10 Hours

Output equation, choice of specific loadings, main dimensions of three phase induction motor, stator winding design, choice of length of the air gap, estimation of number of slots for the squirrel cage rotor, design of rotor bars and end ring, relation between bar and end ring currents. Estimation of no load current, leakage reactance.

Unit-IV

Design of Synchronous Machines : L-10 Hours

Output equation, choice of specific loadings, short circuit ratio, design of main dimensions, armature slots and windings, slot details for the stator of salient and non salient pole synchronous machine. Design of rotor of salient pole synchronous machines, magnetic circuits, dimensions of the pole body, field winding, and rotor of non salient pole machine.

References:

1. Sawhney A. K, “A Course in Electrical Machine Design”, Dhanpat Rai, XVII Edition, 2006.Reactive Power Management, D. Tagare, TMH, 1st Edition, 2004.
2. Mittle, V.N., “Design of Electrical Machine Design”, Standard, 1983.
3. Aggarwal, R.K, “Principles of Electrical Machine Design”, IV Edition, Kataria Publishers, 1992.

Course outcomes:

At the end of the course the student will be able to:

1. Students should be able to identify, list and define different types of materials, parts, insulators, and the terms associated to Electrical machines and design terms
2. Students should be able to classify and explain the Choice of specific loadings of DC, Induction & synchronous machines and transformer
3. Students should be able to derive the expressions and prove the given criterion considering the limitations of the materials

4. Students should be able to calculate the dimension of the machine, number of ampere turns, for a given specific loading
5. Students should be able to estimate the number of slots, number of conductors, turns considering the feature of material & its limitations and the power factor
6. Students should be able to design the machine for a given application considering all the parameters, maximum specific loading, current, voltage, magnetizing current, voltage drop and other parameters of the machine and transformer design

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Department of Electrical and Electronics Engineering

Testing and Commissioning of Electrical Equipment
(Elective)

Subject Code: UEE556E **Credits: 03**
Contact Hours: 03 (3L-0T-0P) **Assessment: CIE 50 and SEE 50**

Unit-I

Transformers : **L-10 Hrs**

Specifications: Power and distribution transformers as per BS standards. Installation: Location, site, selection, foundation details (like bolts size, their number, etc), code of practice for terminal plates, polarity & phase sequence, oil tanks, drying of windings and general inspection

Commissioning tests: Following tests as per national & International Standards, volt ratio test, earth resistance, oil strength, Bucholz& other relays, tap changing gear, fans & pumps, insulation test, impulse test, polarizing index, load & temperature rise test, Installation and commissioning of transformer, causes and troubles and failures in power Transformer and maintenance of transformer.

Unit-II

Synchronous Machines: **L-10Hrs**

Specifications: As per BIS standards.

Installation: Physical inspection, foundation details, alignments, excitation systems, cooling and control gear, drying out.

Commissioning Tests: Insulation, Resistance measurement of armature & field windings, waveform & telephone interference tests, line charging capacitance.

Performance tests: Various tests to estimate the performance of generator operations, slip test, short circuit test, sudden 3 phase short circuit tests, i vibration test and Abnormal conditions and protection

Unit-III

Induction Motors: **L-10 Hrs**

Specifications: for different types of motors, Duty, I.P. protection. i Installation: Location of the motors (including the foundation details) & its control apparatus, shaft & alignment for various coupling. Fitting of pulleys & coupling, drying of windings.

Commissioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations & balancing.

Electrical tests: Insulation test, earth resistance, high voltage test, starting up, failure to speed up to take the load, type of test, routine test

Trouble causes and remedies and protection of induction motor and maintenance of motors.

Unit-IV

Switch Gear and Protective Devices: **L-09 Hrs**

Standards, types, specification, Installation, commissioning tests, type &i routine tests, possible troubles, causes and corrective actions for circuit breakers and maintenance of circuit breakers.

Specifications of VTs, Specifications of CTs, Testing of Current i Transformer and Voltage transformer.

References

1. Testing & Commissioning Of Electrical Equipment -S. Rao, KhannaPublishers.2004
2. Testing & Commissioning Of Electrical Equipment -B .V. S. Rao, Media Promoters and Publication Pvt., Ltd.
3. Testing & Commissioning Of Electrical Equipment- Ramesh L. Chakrasali

Course Outcomes

Students should be able to

1. Identify the different electrical equipment and define all the terms associated with their tests, specifications and standards
2. Explain the procedures and precautions for conduction of different tests
3. Test commission and install any electrical equipment considering all the guidelines specified by India and foreign countries
4. Prepare a maintenance schedule of different equipment and machines
5. Familiar about electrical safety regulations and rules during maintenance.
6. Trouble shooting chart for various electrical equipment, machines and domestic appliance

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Advanced Power Electronics

Subject Code: UEE55XE **Credits: 03**
Contact Hours: 04 (4L-0T-0P) **Assessment: CIE 50 and SEE 50**

Unit-I

01. Introduction to Power Electronics: **05hr**
    Introduction, Applications, switching characteristics of Thyristor, MOSFET,IGBT, GTO, IGCT and MCT
02. Controlled Rectifiers: **05hr**
    Single phase and Three phase full wave controlled rectifier with RL, RLE load, Effect of source and load inductance of single phase bridge controlled converter

Unit-II

03. Inverters: **05hr**
    Detailed study of three phase inverter of 120^0 and 180^0. PWM techniques for single phase and three phase inverter, Space Vector PWM technique for three phase inverter

04. Multilevel Inverter: **05hr**
    Introduction, concept of multilevel inverter, flying capacitor, diode clamped and Cascaded H-Bridge multilevel converter and its application

Unit-III

05. Multiphase Matrix Converter Topologies: **05hr**
    Three-Phase Input with three phase Out Put Matrix converter, Three phase input with Five-Phase Output Matrix Converter, Sinusodial Carrier based PWM techniques
06. AC-Link Universal Power Converter: **05hr**
    Introduction, Hard Switching ac-Link Universal Power Converter, Soft Switching ac-Link Universal Power Converter

Unit-IV

07. Power Electronics for Wind Energy Conversion Systems:**05hr**
    Introduction, Wind Power Conversion: - Control Variables for Wind Turbines, Wind Turbine Concepts. Power Converters for Wind Turbines: - Two-Level Power Converter, Multilevel Power Converter, Multi-cell Converter. Controls and Grid Requirements for Modern Wind Turbines
08. Power Electronics for Photo Voltaic System: **05hr**
    Introduction, Power Curves and Maximum Power Point of PV Systems: Electrical Model of a PV Cell, Photovoltaic Module I–V and P–V curve, MPP under Partial Shading. Grid-Connected PV System, Control of Grid-Connected PV System: Maximum Power Point Tracking Control Methods (Perturb and Observe, Incremental conductance Method, Fractional Open circuit method and Fractional Short Circuit Method)

Reference Books:

1. Rashid .M. H "Power Electronics Hand book", Academic press,2001.
2. Haitham Abu-Rub, Mariusz Malinowski "Power Electronics for Renewable Energy systems, Transportation and Industrial Applications, by, Wiley publishers 2014.
3. Chakaraborty,SimonsandM.GKramer"PowerElectronicforRenewableEnergyand Distributed Energy System" WE (Ed), 2013.

Course Outcomes:

After completion of the course, the students shall be able to:

1. Recall, list and define the various semiconductor switches employed in power electronics circuits
2. Students able to describe the operation and switching characteristics of switches and operation of various advance power converter.
3. Derive the expressions of performance parameters for various power converters connected to R and R L loads.
4. Analyze and compare the behavior of power converters controlled by sine triangle and SVPWM.
5. Design various components for Multi level inverter, matrix converter and universal power converter connected to R, R-L load and renewable energy sources
6. Assess the performance of advance converter connected to renewable energy sources (PV and Wind turbine).

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REACTIVE POWER MANAGEMENT

Subject Code: UEE5XXE **Credits: 03**
Contact Hours: 03 (3L-0T-0P) **Assessment: CIE 50 and SEE 50**

Unit-I

Introduction: L-10 Hours

Importance of reactive power control in electrical power system, objectives of load compensation, ideal compensator, load compensation specific of a compensator, power factor correction and voltage regulation in single phase system, reactive power bias.

Unit-II

Basic requirement in AC power transmission: **L-10 Hours**

Factor affecting stability and voltage, uncompensated Transmission line: performance equations and performance requirement of lines, voltage profile, voltage-power characteristics, load ability characteristics.

Transmission line compensation: types passive/active compensators, series/shunt compensation and compensation by sectioning.

Unit-III

Harmonics: L-10 Hours

Characteristics and un characteristics harmonics, sources, troubles caused by harmonics on electrical equipment, means of reducing harmonics, types of harmonic filters, DC filters IEEE 519-1992 guidelines telephone interferences.

Unit-IV

Reactive power co-ordination : L-10 Hours

Reactive power management and planning, utility objectives, practices, transmission benefits, reactive power dispatch & equipment impact, reactive power forecasting, reactive power control by DSM, power pooling.

References

4. Reactive power control in electric power systems, T. J. E. Miller, John Wiley & Sons NY 2009
5. Reactive Power Management, D. Tagare, TMH, 1st Edition, 2004.
6. Power System Stability and Control. Kundur, TMH, 9th reprint, 2007.
7. Power System Voltage Stability, Carson. W. Taylor, McGraw-Hill, Inc.

Course outcomes:

At the end of the course the student will be able to:

- Student should be able to identify the basics of Reactive power management.
- Student should be able to explain about the reactive power compensator.
- Student should be able to apply the RPM concept in field.
- Student should be able to define the basic requirement in AC power transmission, factor affecting stability and voltage.
- Student should be able to explain about the harmonics on the system and types of harmonic filters.
- Student should be able to express about the reactive power co- ordination.

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Electrical Engineering Materials

Subject Code: UEE55XE **Credits: 03**
Contact Hours: 04 (4L-0T-0P) **Assessment: CIE 50 and SEE 50**

UNIT – I

Conductivity Of Metals: 05 Hours

Introduction, factors affecting the resistivity of electrical materials, motion of an electron in an electric field, equation of motion of an electron, the current carried by electrons, mobility, energy levels of the molecule, emission of electrons from metals, effect of temperature on the electrical conductivity of metals, electrical conducting materials, electrical contact materials, non-linear conductors, thermal conductivity of metals, thermo electric effect.

Insulating Materials: 05 Hours

materials (mica, glass, porcelain, asbestos), organic materials (paper, rubber, cotton silk fiber, wood, plastics and Bakelite), resins and varnishes, liquid insulators (transformer oil) gaseous insulators (air, SF6 and nitrogen) and ageing of insulators.

UNIT – II

Materials for special applications: 05 Hours

Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings, and sintered alloys for breaker and switch contacts

Modern Techniques For Materials Studies: 05 Hours

Optical microscopy, Electron microscopy, Photo electron spectroscopy, Atomic absorption spectroscopy, magnetic resonance, nuclear magnetic resonance, electron spin resonance and ferromagnetic resonance.

UNIT – III

Magnetic Materials: 06 Hours

Introduction Properties and Application of Piezoelectric materials, Eletrostrictive materials, Ferromagnetic materials, Magnetostrictive materials, Shape memory alloys, Electro archeological fluids, Magneto archeological fluids, Smart hydro gels

Ceramics: 03 Hours

Properties, application to conductors, insulators & capacitors Plastics, rubber

UNIT – IV

Amorphous Materials: 05 Hours

Crystalline versus Amorphous solids, glass formation, Techniques of preparation, Structural models of Amorphous materials, properties of met glasses

Wind Turbine Blades materials: 05 Hours

Composites materials for wind turbine blades, Fibers, Carbon fibers, Aramid, Basalt, Matrix, Thermosets, Thermoplastics

Reference Books:

1. An Introduction to Electrical Engineering- Indulkar C.S. &Thiruvengadam. S Chand & Company; 4th Edn. 2004 edition (1 December 2006)
2. Materials Science for Electrical and Electronic Engineers, Ian P. Jones, Oxford University Press, Indian Edition, 2007
3. Electrical Properties of Materials, L.Solymar, D.Walsh, 8th Indian Edition- Oxford

University Press Seventh Edition.
4. MEMS and MOEMS Technology and Applications, P.Rai-Choudhury (Editor), PHI, 2009.
5. Introduction to Electronic Properties and Materials, DavidJiles, CRC Press, 2nd Edition.

Course outcomes:

1. An ability to apply basic concept and principles of electrical materials.
2. Formulate to solve engineering problems.
3. Concept of solar cell materials helps in designing.
4. An ability to identify a materials and its structure.
5. To gain the knowledge of properties and engineering application of ceramics and amorphous materials.

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Department of Electrical and Electronics Engineering

Digital Signal Processing Laboratory

Subject Code: UEE561L **Credit: 01**
Contact Hours: 02 (0L-0T-2P) **Assessment: CIE 50 and SEE 50**

List of Experiments:

1. Generation of Unit step, ramp, exponential and sinusoidal signals
2. Convolution of two signals
3. To determine power and energy of the signals
4. To determine impulse response given y(n) and x(n)
5. To determine DTFT of given sequence
6. Circular convolution of two given sequences
7. Computation of N – point DFT of a given sequence and to plot magnitude and phase
8. Linear convolution of two sequence using DFT and IDFT
9. Circular convolution of two sequences using DFT and IDFT
10. Design and implementation of FIR and IIR fitter to meet given specifications.
11. Study of DSP starter kits (DSK)
12. Linear convolution Using DSK
13. Circular Convolution using DSK
14. Computation of N point DFT using DSK

Course outcomes:

After the completion of the course, the student will be able to :-

1. Students should be able to generate universal discrete signals of signal systems & digital signal processing using MATLAB/CCStudio
2. Students should be able to write/model the programme for signal processing experiments in MATLAB/CCStudio
3. Students should be able to compare & contrast results of conducted signal processing experiments with theoretical calculations

Laboratory Assessments:

1) Each Laboratory is evaluated for 100 marks (50 CIE and 50 SEE)
2) Allocation of 50 marks for CIE
    - Performance and journal write-up: Marks for each experiment = 30 Marks.
    - One practical test for 20 Marks (5 marks write up, 10 marks conduction, calculation, Results etc.., 5 marks viva – voce).
3) Allocation of 50 marks for SEE. 25% write-up, 50% conduction, calculation, results etc., 25% Viva – Voce..

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[TEQIP Lead Institute, Govt. Aided Institution, AICTE Recognized, Affiliated to VTU Belgaum]
Bagalkot-587103, Karnataka, India.

Department of Electrical and Electronics Engineering

Control Systems Laboratory

Subject Code: UEE562L **Credit: 01**
Contact Hours: 02 Hrs **Assessment: CIE 50 and SEE 50**

1. Determine time domain response of second order systems for step input and obtain performance parameters.
2. **a)** Experiment to draw the speed – torque characteristic of a A.C. servomotor.
   b) Experiment to draw the speed torque characteristic of a D.C. servomotor.
3. Design a passive RC lead compensating network for the given specifications, viz., the maximum phase lead and the frequency at which it occurs and to obtain its frequency response.
4. Study the synchro-transmitter and receiver and obtain output vs input characteristics.
5. Determine experimentally the frequency response of a second -order system and evaluation of frequency domain specifications.
6. Design RC lag compensating network for the given specifications. viz., the maximum phase lag and the frequency at which it occurs, and obtains its frequency response.
7. Experiment to draw the frequency response characteristic of a given lag- lead compensating network.
8. Design a PID controller and study its effect on steady state error.
9. Plot the root locus diagram of an open loop transfer function and determine range of gain 'k' for stability. Using MATLAB software
10. Plot a Bode diagram of an open loop transfer function. Using MATLAB software
11. Draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system. Using MATLAB software.

Course outcomes:

After the completion of the course, the student will be able to :-

1. Execute the frequency response and time response analysis of a second order control system through conduction.
2. Analyze and interpret stability of the system through Root Locus, Bode plot and Nyquist plot. Using MATLAB
3. Design Lag, Lead, Lead-Lag compensators and verify experimental results through conduction.
4. Analyze and verify experimental results of a toque- speed characteristic of DC and AC servomotors.
5. Analyze the effect of P, PI, PD and PID controllers on a control system.

Laboratory Assessments:

1) Each Laboratory is evaluated for 100 marks (50 CIE and 50 SEE)
2) Allocation of 50 marks for CIE
   - Performance and journal write-up: Marks for each experiment = 30 Marks.
   - One practical test for 20 Marks (5 marks write up, 10 marks conduction, calculation, Results etc.., 5 marks viva – voce).
3) Allocation of 50 marks for SEE. 25% write-up, 50% conduction, calculation, results etc., 25% Viva – Voce..

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Department of Electrical and Electronics Engineering

Analog and Digital Electronics Laboratory

Subject Code: UEE563L **Credit: 01**
Contact Hours: 02 (0L-0T-2P) **Assessment: CIE 50 and SEE 50**

List of Experiments:

1. Design and testing of diode clipping and clamping circuits.
2. Design of fixed bias and voltage divider bias circuits for BJT.
3. Design of RC coupled single stage BJT amplifier and determination of the gain, frequency response, input and output impedances.
4. Calculation of hybrid parameters of a CE transistor amplifier
5. Simplification, realization of Boolean expressions using logic gates /Universal gates.
   (i) Realization of Full adders and Full Subtractors using logic gates
   (ii) Realization of parallel adder/subtractors using 7483 chip
6. Realization of Binary to Gray Code conversion and vice versa.
7. MUX / DEMUX-use of 74153, 74139 for arithmetic circuits and code converters
8. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
9. Truth table verification of Flip- Flops (i) JK Master slave (ii) T type and (iii) D type
10. Realization of 3 bit counters and MOD- N counter design (7490, 74193).
11. Shift left; Shift Right; SIPO, SISO, PIPO, PISO, operations using 74S95.
12. Ring counter and Johnson counter.

Course outcomes:

After the completion of the course, the student will be able to :-

1. Student should be able to select appropriate components and write the requirement table based on experiment
2. Student should be able to write the procedure, simplify the expressions using K-map and realize the circuit
3. Student should be able to rig-up the circuit and verify output

Laboratory Assessments:

4) Each Laboratory is evaluated for 100 marks (50 CIE and 50 SEE)
5) Allocation of 50 marks for CIE
   - Performance and journal write-up: Marks for each experiment = 30 Marks.
   - One practical test for 20 Marks (5 marks write up, 10 marks conduction, calculation, Results etc.., 5 marks viva – voce).
6) Allocation of 50 marks for SEE. 25% write-up, 50% conduction, calculation, results etc., 25% Viva – Voce..