BOS Date: 05.06.2021

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE,
(ENGINEERINGCOLLEGE)
VIDISHA (M.P.) – 464001
DEPARTMENT OF ELECTRICAL ENGINEERING

Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical VI sem.	Electrical Drives	EE-1861	3	0	2	4

Pre-requisite: Power Electronics and Electrical Machines

Course Objectives:

1. To classify the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric Drives an enabling technology.
2. Illustrate the basic requirements placed by mechanical systems on electric drives.
3. Explain the basic principles of power electronics in drives using pulse width modulation to synthesize the voltages in ac motor drives.
4. Rephrase the operation of dc motor drives to satisfy four-quadrant operation to meet mechanical load requirements.
5. Design torque, speed and position controller of motor drives.
6. Explain speed control of induction motor drives in an energy efficient manner using power electronics.

Topic Covered:

Unit I

FUNDAMENTALS OF ELECTRIC DRIVES

Electrical drives and introduction: Electric drives, advantages of electrical drives, parts of electrical drives, choice of electrical drives. Types of load, load with translational motion, load with rotational motion, load torque that vary with time, Selection of Motor Power Rating.

DYNAMICS OF ELECTRICAL DRIVES

Fundamental torque equation, speed-torque convention and multi quadrant operation, dynamics of motor load combination, nature and classification of load torque, measurement of moment of inertia, calculation of acceleration time in transient operation, acceleration time for specific nature of motor and load torque, load equalization, stability of electrical drives.

Unit II

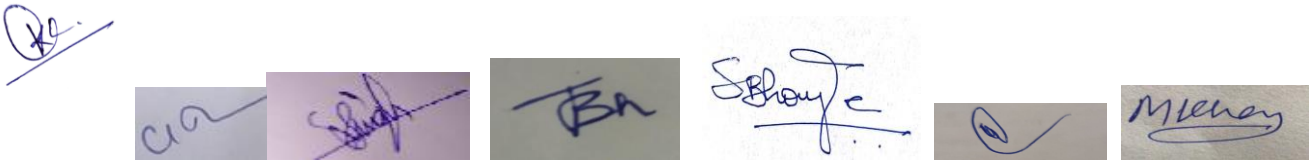
POWER ELECTRONICS CONTROL OF DC DRIVES

Review of DC Motors and its performance, starting, braking, controlled rectifier fed DC drives with continuous and discontinuous mode of operation, Supply Harmonics, Power Factor and ripple in motor current, Chopper Controlled DC Drives, Sources of current harmonics in chopper, Converter Ratings and closed loop control.

Unit III

POWER ELECTRONICS CONTROL OF AC DRIVES

Review of Three phase Induction Motor and its performance, starting, braking, Static Voltage control, Variable Frequency Control (VSI, CSI, Cyclo-converter based), static rotor resistance control and slip power recovery control schemes. Introduction of Scalar Vector Control of 3 phase induction motor.



Unit IV

THREE PHASE SYNCHRONOUS MOTORS

Review of Three phase Synchronous Motor and its performance, self controlled schemes, Variable frequency control of multiple synchronous motor, Permanent magnet AC motor drives, Brushless DC Motor Drives

Unit V

INDUSTRIAL APPLICATIONS

Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars.

SPECIAL DRIVES

Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor, Digital control of drives.

TEXT BOOK:

1. Pillai S. K. "A first course on Electrical Drives", Second edition, Wiley Eastern.
2. Dubey G. K., "Power Semiconductor Controlled Drives", Prentice-Hall, Englewood Cliffs! .
3. Dubey G. K. , "Fundamentals of Electrical Drives". Narosa Publishing House.
4. De N.K., Sen P.K. "Electric Drives", Prentice Hall of India, Second Edition , 2001.

REFERENCE BOOKS:

1. Bose B. K., "Power Electronics and AC Drives", Prentice-Hall.
2. Murphy M. D., and Tumbuli F., "Power Electronic Control of AC Motors", Pergamon Press, OxfordUniversity Press.
3. P.V. Rao, "Power semiconductor Drives", BS Publications
4. Krishnan, R, "Electric Motor Drives: Modeling, Analysis and Control " ,Prentice Hall of India, Second Edition , 2001.
5. Ned Mohan et al, "Power Electronics: Converters, Applications, and Design", John Wiley & Sons. Inc., 2nd Edition, 1995.
6. Werner Leonhard, "Control of electrical drives", Springer, 1995.

Course Outcomes: At the end of this course, students will demonstrate the ability to

CO1: Acquire knowledge and able to demonstrate fundamental of electric drives, its dynamics, its control through power electronics devices (BL1, BL2).

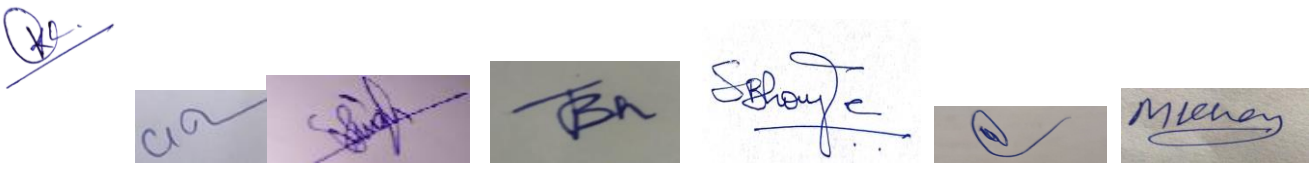
CO2: Analyse electric drives systems based on nature of loads, control objectives, performance and reliability (BL3, BL4).

CO3: Evaluate performance of electrical drives based on voltage rating, current rating, power factor, speed, torque and other characteristics (BL3, BL5)

CO4: Design and justify new control and power conversion schemes for implementing alternative solutions considering the critical and contemporary issues (Bl3, BL6)

List of Experiments

1. To study various types of load and selection of drive. (CO1)
2. Dynamic Braking of D.C. shunt motor. (CO2)
3. Dynamic Braking of 3 phase induction motor. (CO2)
4. Counter current braking of D.C. shunt motor. (CO2)
5. Counter current braking of 3 phase squirrel cage induction motor.(CO2)
6. Speed control of D.C. motor using ward Leonard control method. (CO3)
7. Speed control and direction control of separately exited dc motor using half controlled rectifier. (CO3)
8. Speed Control of DC Motor using Chopper. (CO3)
9. Vector Control method for three phase induction motor. (CO3)
10. Study of Switch Reluctance Motor. (CO1).



11. Three phase permanent magnet synchronous motor drive simulation using MATLAB (CO4).
12. Three phase three level PWM converter simulation using MATLAB (CO4)
13. Chopper fed DC motor drive simulation using MATLAB (CO4)
14. Speed control DC Motor using BJT-H bridge simulation using MATLAB (CO4).

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Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical VI sem.	Microprocessor & Microcontroller	EE-1862 (A)	3	0	2	4

Pre-requisite: (i) Digital Electronics (ii) Analog Electronics

Course Objective:

1) To omit the students to understand importance of microprocessor in calculation & in automation.
2) To Impart the knowledgeof register set and memory map of microprocessor.
3) Explain the instruction set of microprocessor & microcontroller.
4) To elaborate to write assembly language program.
5) Understand need, importance of peripheral chips and their interfacing to microprocessor.
6) To discuss the need, importance of microcontroller and its applications.

Topic Covered:

Unit-I

Microprocessor concepts, architecture of Intel 8 bit microprocessor 8085, pindiagram, pinfunction Instruction set, Interrupts, and assembly language programming, Addressing modes.

Unit-II

Overview of 16 bit/32 bit/ 64 bit Intel based microprocessor, architecture of 16 bit 8086 processor, pin diagram pin function , instruction set of 16 bit microprocessor, interrupts addressing modes, assembler directives, assembly language programming.

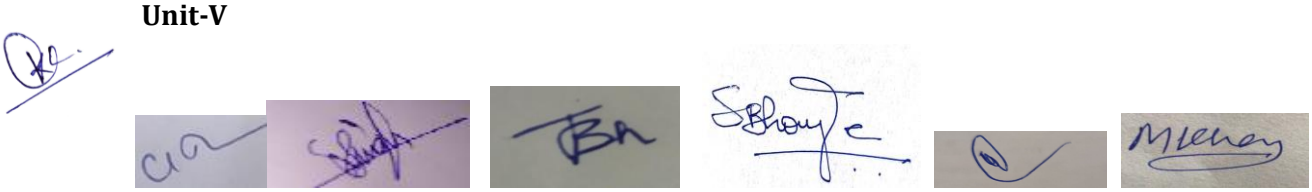
Unit-III

Programmable parallel interface I/O controller IC 8255 functional schematic, pin function operating modes, interfacing with 8 bit/16 bit microprocessor. Serial communication interface chip (8251) functional schematic, pin function operating modes.

Unit-IV

Programmable interval timer (8254) functional schematic, pin function, interfacing with 8 bit/16 bit microprocessor, DMA controller (8257) functional block diagram, pin function, pin function and architecture of DAC/ADC chip interfacing with 8 bit/16 bit microprocessor. Programmable interrupt controller (8259), functional block diagram, pin function, operating modes.

Unit-V



Intel 8 bit microcontroller and register set, instruction set, interrupts, counter and timing operations of 8051, Addressing modes.

TEXT BOOK:

1. Microprocessor Architecture, Programming and Applications with 8085 by R.S. Gaonkar, Witey Eastern Ltd, New Delhi.
2. Advanced Microprocessors and Peripherals by A.K. Ray, KM Bhurchandi. Tata McGraw Hill Publishing Company Ltd.
3. Microprocessor and Interfacing by D.V. Hall, PHI Publication.
4. The 8051 Microcontroller and Embedded system by M.A. Mazidi & J.G. Mazidi Pearson Education.

REFERENCE BOOKS

1. Microprocessor Based Design by Michael Slater PHI Publication Microprocessor & Microcontrollers by Dr. B.P.Singh

Course Outcomes - After successful completion of this course student will able to understand, demonstrate and apply

CO 1: Acquire and demonstrate fundamental knowledge of microprocessors or interfacing and programming (BL1,BL2)

CO 2: Analyze the performance of microprocessor with the help of instruction set (BL3, BL4)

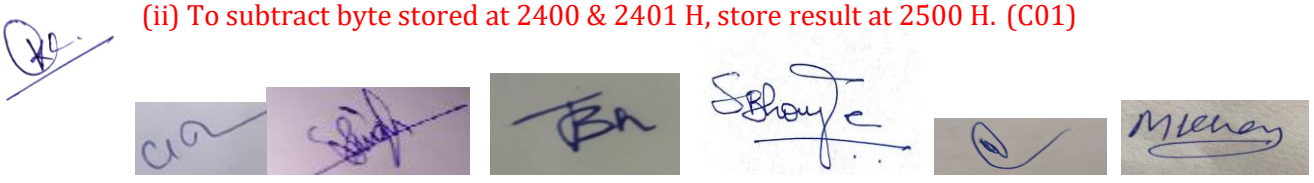
CO 3: Define instruction sets and write assembly language programming. (BL3, BL6)

CO 4: Evaluate performance of 8085 and 8086 compare them. (BL3, BL5)

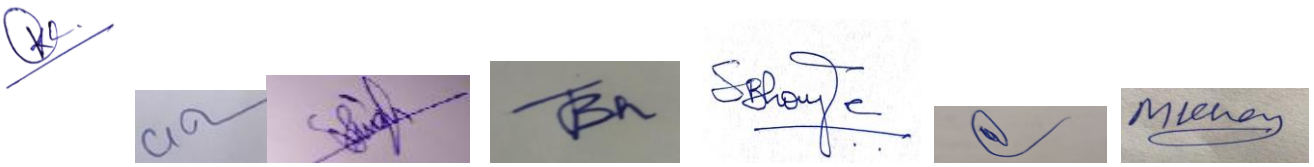
List of Experiments (Need correction)

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers. -CO4
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers. -CO4
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set. -CO3
5. To write a program to arrange an array of data in ascending and descending order. -CO4
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set. -CO2
7. To write a program to initiate 8251 and to check the transmission and reception of character. -CO4
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes. -CO2
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave. -CO2
10. Serial communication between two 8085 through RS-232 C port.-CO2
11. Programs for 16 bit arithmetic operations for 8086 (using various addressing modes) -CO4
12. Program for sorting an array for 8086 -CO4
13. Program for searching for a number or character in a string for 8086 -CO4
14. Program for String manipulations for 8086 -CO4
15. Program for digital clock design using 8086. -CO4
16. Interfacing ADC and DAC to 8086.-CO2

1. Write an assembly language program using 8085 instruction set to read delta in B, C, D, registers and shift them to register and shift then in A, E, H register.(C01)
2. Write program in assembly language using 8085 instruction set to
   (i) Add two data bytes stored at 2500 & 2501 H, store result at 2502 H on words.
   (ii) To subtract byte stored at 2400 & 2401 H, store result at 2500 H. (C01)



3. Write program in assembly language using 8085 instruction set to multiply two data bytes stored at 2400 H & 2401 H, store result at 2402 H on words.(C01)
4. Write program in assembly language using 8085 instruction set to divide two numbers stored at 2500 H & 2501 H, store quotient at 2503 H & remained at 2504 H. (C01)
5. Write program in assembly language using 8085 instruction set to shift data at 2500 H to 2505 H and shift this data using PUSH, POP instructions.(C01)
6. Write program in assembly language using of to bytes intel 8086 instruction set to shift block of data from 2400:0001 H to 2400:0001 H on words.
   (i) in same order
   (ii) in reverse order (C02)
7. Write program to do multi byte addition of data using 8086 instruction set.(C02)
8. Write assembly language program using 8086 instruction set to file out factorial of 5 H.(C02)
9. Write assembly language program to find out frequency (No of appearance of given data in stored bytes at location 2400:0002 on words store result at 2400:0001 H(C02)
10. Interfacing and generation of square wave of different frequency using intel 8255 chip.(C03)
11. Generation of symmetrical and unsymmetrical pulses by 8051.(C05)
12. Interfacing and generation of different waves of different frequency using intel 8254 chip.(C04)



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Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical VI sem.	Electrical Machine Design	EE-1863 (A)	3	0	2	4

Pre Requisites: Electrical Machine, Electrical Engg. Drawing

Course Objectives -

1 To explain Introduction, design of electrical machine, types of materials and insulators.
2 Classify the design of armature slots, yoke, poles, inter poles, field winding in DC machine.
3 Explain the transformer design of tank, cooling tubes, windings and determine the main dimensions.
4 Develop the of rotor bar, end ring, slip ring, stator winding design for induction motor.
5 Construct the for synchronous motor like rotor of salient poles, pole body, field winding is learn by students.

Topic Covered:

UNIT-1

PRINCIPLES OF ELECTRICAL MACHINE DESIGN: Introduction, considerations for the design of electrical machines, limitations. Different types of materials and insulators used in electrical machines.

UNIT-II

DESIGN OF DC MACHINES: Output equation, choice of specific loadings and choice of number of poles, design of Main dimensions of the DC machines, Design of armature slot dimensions, commutator and brushes, magnetic circuit -estimation of ampere turns, design of yoke and poles-main and inter poles, field windings – shunt, series and inter poles.

UNIT -III

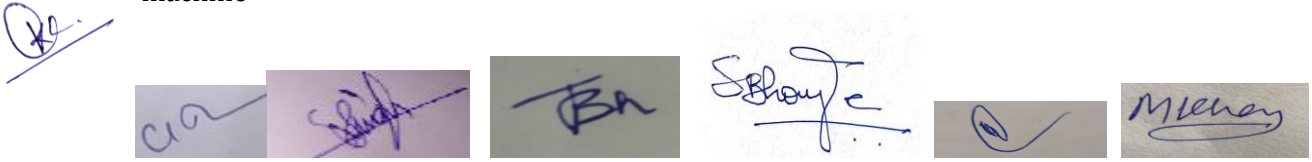
DESIGN OF TRANSFORMERS (Single phase and three phase): Output equation for single phase and three phase transformers, choice of specific loadings, expression for volts/turn, determination of main dimensions of the core, types of windings and estimation of number of turns and conductor cross sectional area of Primary and secondary windings, estimation of no load current, expression for leakage reactance and voltage regulation. Design of tank and cooling tubes (round and rectangular)

UNIT -IV

DESIGN OF INDUCTION MOTORS: 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, design of Slip ring induction motor, estimation of No load current and leakage reactance, and circle diagram.

UNIIT -V

DESIGN OF SYNCHRONOUS MACHINES: 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 machines. Design of rotor of salient pole synchronous machines, magnetic circuits, dimensions of the pole body, design of the field winding, and design of rotor of non-salient pole machine



TEXT BOOK:

1. A Course In Electrical Machine Design, A.K.Sawhney,Dhanpatt Rai & Sons
2. Design Of Electrical Machines, V. N. Mittle, 4th edition

Reference Books:

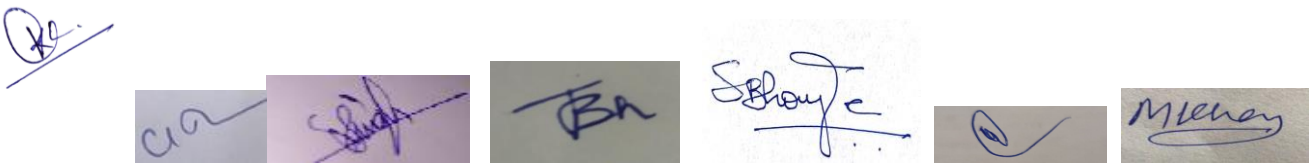
1. Performance And Design Of AC Machines, M.G.Say,CBS Publishers and Distributors Pvt.Ltd.
2. Design Data Handbook, A.Shanmugasundarm, G,Gangadharan,R.Palani,Wiley Eastern Ltd.

Course out comes–At the end of this course, students will be able to :

CO1: Acquire knowledge and able to demonstrate characteristics, response, performance parameters and principle of electric machine design, design of DC machine, Transformer, Induction motor and synchronous motor. (BL1, BL2)
CO2: Analyse different performance parameters of DC machine, Transformer, Induction motor and synchronous motor for design purpose. (BL3, BL4)
CO3: Evaluate different parameters of machines. (Bl3, BL5)
CO4: Design DC motor, Transformer, Induction motor and synchronous motor based on specification provided. (Bl3, BL6)

List of Experiments

1. Develop sheet and using MATLAB writes a program to design single phase transformer which have output 200 KVA 50 Hz core type. A cruciform core is used with distance between two adjacent limbs equal to 1.6 times the width of core lamination. Assume voltage per turn 14. Maximum flux density 1.1 Wb/m2, windows space factor is 0.32, current density 0 amp/mm2, stacking factor is 0.9. The net iron area is 0.56d2 in a cruciform core where d is diameter of circumscribing circle. Also the width of largest stamping is 0.85d. (CO2, CO4).
2. Develop sheet and Using MATLAB write a program to calculate the main dimension detail of a 10KVA, 2000/400 V, 50 Hz, single phase shell type oil immersed self cooled transformer. Assume voltage per turn 10V,flux density 1.1 wb/ m2, current density 2 A/mm2, window space factor 0.33, the ratio of window height to window width is 3 and the ratio of core depth to width of central limbs is 2.5, the stacking factor is 0.9. (CO2, CO4)
3. Develop sheet and using MATLAB write a program to design a 11 KW, 3 phase, 440 volt, 50 Hz, 1000 synchronous rpm, squirrel cage induction motor having a full load efficiency of 0.86 and a power factor of 0.86. The temperature rise should not exceed 50 °C. (CO2, CO4).
4. Develop sheet and using MATLAB write a program to find main dimension of 75000 KVA,13.8KV,50Hz , 62.5 rpm, 3 phase star connected alternator also find number of stator slot, conductor per slot. The peripheral speed should be about 40m/sec assume average gap density 0.65 wb/m2 and conductor per meter is 40000 and current density is 4A /m2. (CO2, CO4).
5. Using Matlab write a program to calculate the mmf required for the air gap of a machine having core length 0.32m including 4 ducts of 10 mm each, pole are 0.1m, slot pitch 65.4mm; slot opening is 5mm; air gap length 5mm; flux per pole 52 Wb/m. Given Carter's co-efficient is 0.18 for opening /gap 1; and is 0.28 opening/gap equal to 2
6. Design and prepare sheet for 100kVA, 3-Phase, and 11kV/400V transformer.
7. Design and develop sheet for 25 H.P. 3-Phase, 400V Induction Motor.
8. Develop algorithm and write program for designing of 3-Phase Induction Motor.
9.



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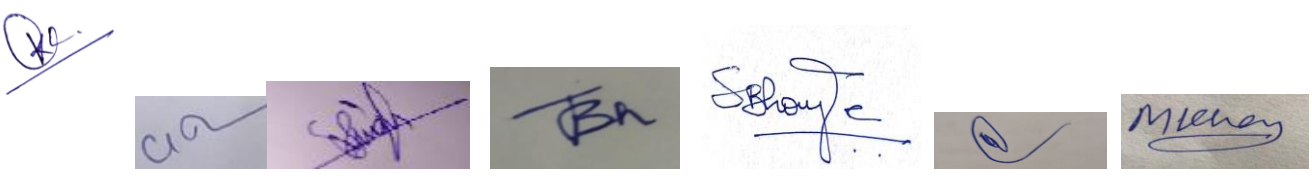

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Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical VI sem.	Power System Analysis & Control	EE-1864 (A)	3	0	0	3

Pre Requisites: Power system

Course Objectives:

1. To have an overview of power system operation and control.
2. To impart the knowledge of load flow study, formation of bus admittance and impedance matrix and numerical methods to solve the power flow problems.
3. Explain the economic operation of power system.
4. To illustrate the system stability of power system.
5. To relate the system stability status of power system under transient conditions.
6. To understand power frequency dynamics and to design power frequency controller.
7. To explain reactive power voltage interaction and the actions to be implemented for maintaining the voltage profile against varying system load.

Unit-I

General - Problems associated with modern interconnected power System, introduction of excitation system, types of excitation system, introduction of load forecasting, types of load forecasting, deregulation of power system.

Unit-II

Load flow Analysis: Power flow equations, power flow problems, solutions using Gauss- Seidel, Newton Raphson methods. Impedance and admittance matrices. Load flow problems in two bus and multibus system.

Unit-III

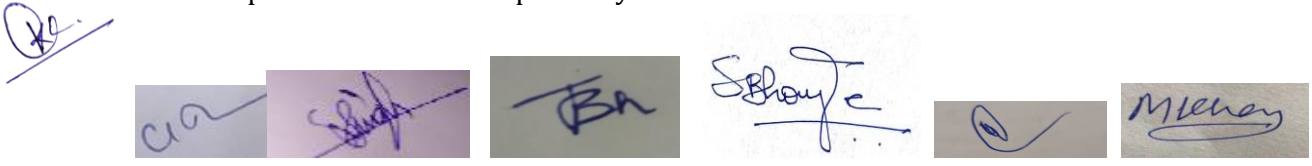
System Stability : Steady state, dynamic and transient stability swing equation, equal area criterion, solution of swing equation using step by step method, modified Eulers method and Runga Kutta method, methods of improving transient stability.

Unit-IV

Power Frequency control: Fundamental characteristics of power control mechanism of individual generator, excitation and prime mover control, concept of area control, load frequency control of an isolated power system, division of load between generation (load sharing) interconnection of system elements to form two bus system, Tie line and its application

Unit-V

Voltage & Reactive Power Control : Generation and absorption of reactive power, reactive power compensation techniques, methods of voltage control, voltage stability, static and rotating VAR generators, control by transformers (on line tap changing), automatic generation control, AVR, SCADA and computer level control of power system.



TEXT BOOK:

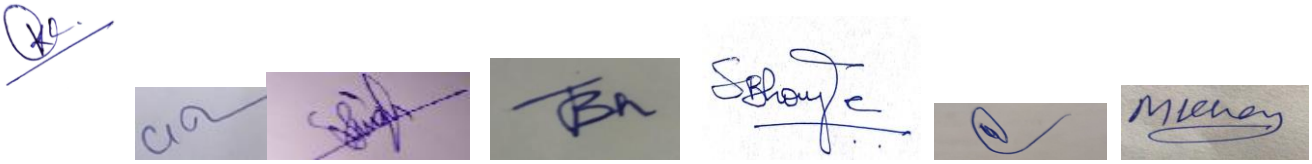
1. Electrical Power system by C.L. Wadhwa .
2. Modern Power System Analysis-by I.J. Nagrath & D.P. Kothari.
3. Power system operation and control by P.S.R.Murthy.

REFERENCE BOOKS:

1. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.
2. T.K. Nagsarkar, M.S. Sukhiza, -"Power System Analysis", OxfordUniversity Press.
3. Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition.
4. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York.
5. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York.
6. Weedy B.M. "Electric Power System" John Wiley.

Course Outcomes - After successful completion of this course student able to:

CO1: Acquire knowledge of and able to demonstrate the concepts and principle of interconnected power system, excitation and load, load flow analysis, stability analysis, frequency, and voltage reactive power control. (BL1, BL2)
CO2: Analyze system ability, methods for power frequency control, voltage and reactive power control and load flow (BL3, BL4)
CO3: Using different methods evaluate the system performance based on stability, voltage, power, and frequency control.(BL3, BL5)



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Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical VI sem.	Signals and Systems	EE-1865 (OC-2)	3	0	0	3

Pre-requisite: Basic mathematics, basic knowledge of differential equations, Network Analysis

Course Objective:

1. To build the knowledge about various signals and system and their properties.
2. To explain the knowledge of behavior of continues and discrete time LTI systems
3. To discussthe Fourier, Laplace and Z transforms of system.
4. To develop ability to sample & reconstruct the co-continuous signals.

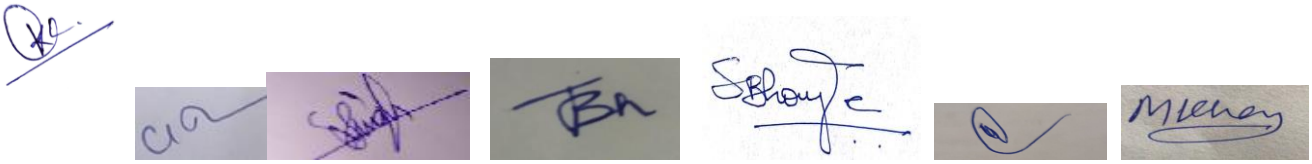
Unit 1: Introduction to Signals and Systems:
Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

Unit 2: Behavior of continuous and discrete-time LTI systems
Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

Unit 3: Fourier, Laplace and z- Transforms
Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The DiscreteTime Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

Unit 4:
Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

Unit5:
Sampling and Reconstruction



The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

REFERENCE BOOK:

1. R.F. Ziemer, W.H. Tranter and D.R. Fannin, Signals and Systems - Continuous and Discrete, 4th Edn. Prentice Hall, 1998.
2. A. Papoulis, Circuits and Systems, Modern Approach, HRW, 1980
3. Simon Haykin and Barry Van Veen, "Signals and Systems", Second Edition, Wiley International

TEXT BOOK:

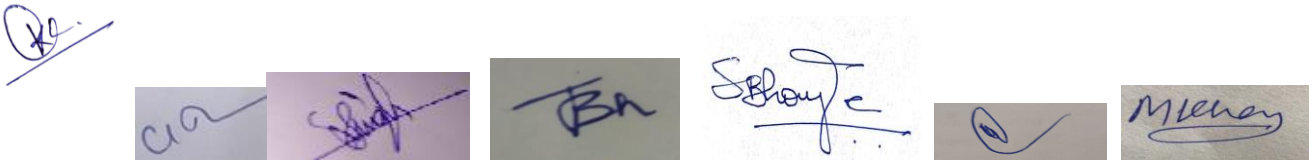
1. A.V. Oppenheim, A.S. Willsky and I.T. Young, Signals and Systems, Prentice Hall, 1983.
2. M. J. Roberts, "Signals and Systems",2003, Tata McGraw-Hill.
3. S.Salivan, "Digital signal Processing", TMH, 2006

Course Outcomes: After successful completion of this student gain following course outcomes:

CO 1: Acquire knowledge of basics, fundamentals of signal & systems and identify basic process involved in signal & system interaction. Apply the basic concepts in Modeling and transform domain analysis (BL1, BL2, and BL3).

CO 2: Analysis signal & system in time and frequency domain and extract the necessary information Model, analyze and synthesize the systems and performance of systems (BL3, BL4).

CO3: Evaluate system performance on the basis of different inputs (BL3, BL5).



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VIDISHA (M.P.) – 464001
DEPARTMENT OF ELECTRICAL ENGINEERING

Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical VI sem.	Minor Project-1	EE-1866 (DLC)	0	0	4	2

Pre-requisite: Electronics-1, Power Electronics & Electronics-II

Electrical Engineering Minor project aims to exposing the students with electronic components, their rating, testing devices, circuits, measuring instruments. Electrical wiring components and installations. Students are expected to learn about basic principle of operation, assembly of circuits using different components, PCB making, repair and fault finding in electrical machines and installations.

Course Outcomes

At the end of this course, students will demonstrate the ability to:

CO1. To understand practice acquired knowledge within the chosen area of technology for project development
CO2.To discuss,identify and justify the technical aspects of the chosen project with a comprehensive and systematic approach
C03.To design, improve and refine technical aspects for engineering projects
CO4. Plan to work as an individual or in a team in development of technical projects
CO5.Propose for communicate and report effectively project related activities and findings