SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Electrical Engg.

Semester/Year		V/III	Program		B.Tech
Subject Category	Departmental Course	Subject Code:	EE- 501	Subject Name:	Control System

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Dynamics; Differential equations; Laplace transforms; basic Electrical circuits

Course Objective:

1. To illustrate the students with concepts of block diagrams and transfer functions.
2. To explain the students characteristics of closed-loop control systems, including steady-state and transient response, parametric sensitivity, disturbances, error, and stability.
3. To classify the basic performance criteria for first and second order systems.
4. To teach students basic control system design methods, including root locus diagrams and frequency response methods.
5. Explain students to the basic concepts of proportional, integral, and derivative (PID) control.
6. Illustrate the students to existing software tools used for control system design.

Course Outcomes:

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

CO1: Acquire knowledge and understand of different types of systems and their representation, stability, time domain and frequency domain behaviour controllers and compensators to obtain mathematics.

CO 2: Apply knowledge to obtain mathematical modeling of different systems, find out transfer function and obtain knowledge, signal flow graph and state space representation.

CO 3: Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.

CO 4: Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO 5: Design feedback controllers and compensation circuits &develop and analyze state space models.

UNITs	Descriptions	Hrs.	CO's

Abbreviations: ES -End Semester, MS- Mid Semester, LW- Laboratory Work/Assignment. (L: Lecture, T: Tutorial, P: Practical), BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanities Science and Management Course, MAC- Mandatory, Audit Course, AC- Audit Course, HEC- Holistic Education Courses: NSS/NCC/NSO, ITC- Information Technology Course, ILC-Institute Level Course, DC- Department Course, DE-Department Elective, OC- Open Course, DLC- Department Laboratory, PROJ- Project Work, VA-Value Added Course

I	Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra. Signal flow graph, Mason's formula, Error detectors (Synchros& Potentiometer), Servomotors (AC & DC), techo-generators.	8	CO1
II	Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Steady state error & error constants.	10	CO2
III	Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci. Effect of adding poles and Zeros on the loci, Stability by root loci.	8	CO3
IV	Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.	7	CO4
V	Design of control systems with PD/PI/PID Control in time domain and Frequency domain, leadlag, Lag-lead compensation, Design of compensating networks. Solution of state equation: Eigen values & eigenvectors digitalization state transitive matrix	7	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of experiments:

1. To plot Poles and zeros in s plane and analyze system stability in MATLAB
2. To plot speed torque characteristics of D.C. servo motor.
3. To plot speed torque characteristics of A.C. servo motor.
4. Study of a D.C. position servo system.
5. Step response of a second order system.
6. To study synchronous characteristics.
7. To draw SFG in MATLAB
8. Sketch different frequency methods in MATLAB.
9. To study the time response of PI and PID controller.
10. 11. To study Temperature Control System.
12. To study the frequency response of the lag and lead process.

Text Book-

1. B.S. Manke Linear control system Khan Publisher.
2. S. Hassan Squeed Automatic Control system, Katson Book.

Reference Books-

1. I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
2. K. Ogata, Modern Control Engineering, PHI.
3. B.C. Kuo, Automatic Control systems, PHI
4. Gopal M., Control System : Principles & Design, TMH.
5. N.K. Sinha, Control Systems, New Age International
6. Stefani, Shahian, Savant, Hostetter – "Design of feedback control System's", Oxford.
7. Bishop and Dorf, Modern Control System, Pearson

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assg (10)	Quiz (10)	Total (100)
Practical (30)	Lab work (10)	Quiz (10)	-	Total (50)

List/Links of e-learning resource

- NPTEL

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	
Compiled and designed by	Prof. Sudhir Sharma
Subject handled by department	Electrical Engg.

Abbreviations: ES -End Semester, MS- Mid Semester, LW- Laboratory Work/Assignment. (L: Lecture, T: Tutorial, P: Practical), BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanities Science and Management Course, MAC- Mandatory, Audit Course, AC- Audit Course, HEC- Holistic Education Courses: NSS/NCC/NSO, ITC- Information Technology Course, ILC-Institute Level Course, DC- Department Course, DE-Department Elective, OC- Open Course, DLC- Department Laboratory, PROJ- Project Work, VA-Value Added Course

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Department of Electrical Engineering

Semester/Year		III /II	Program		B.Tech
Subject Category	Departmental Course	Subject Code:	EE-502	Subject Name:	Power Electronics

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Electronics-1, Network Analysis

Course Objective:

1. To outline the working of uncontrolled devices.
2. To introduce the basic theory of power semiconductor devices and passive components, their practical application in power electronics.
3. To familiarize the operation principle of AC-DC, DC-DC, DC-AC conversion circuits and their applications.
4. To analyze power electronics circuits and understand circuit operation by drawing output waveforms.

Course Outcomes:

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

CO1: Explain the characteristics, functions, and applications of various power electronic devices such as SCR, Power Transistor, MOSFET, GTO, IGBT, and MCT.
CO2: Design and analyze single-phase and three-phase controlled rectifiers with different types of loads (R, R-L, R-L-E).
CO3: Understand the principles of chopper operation and design chopper circuits for various applications, including step-up and step-down choppers.
CO4: Analyze the operation of single-phase and three-phase inverters, and implement voltage control and harmonics reduction techniques.
CO5: Explain the principles and applications of AC voltage controllers and cycloconverters for various load types (R and RL).

UNITs	Descriptions	Hrs	CO's

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I	**Introduction and Power Semiconductor Devices :**Power Electronics : Scope and applications, Introduction to power electronics devices, SCR, Power Transistor, MOSFET, GTO, IGBT, MCT etc. Thyristor V-I and Gate Characteristics, Two transistor analogy of SCR., methods of triggering and commutation (A,B,C,D,E,F), ratings and protection of device, snubber circuits and safe operating area. Firing circuit.	7	CO1
II	**Phase Controlled Rectifiers :**Principle of phase control, single phase half wave controlled rectifiers with R, R-L, R-L-E load, single phase full wave controlled converters, 2-pulse mid-point converters, 2-pulse half and fully controlled bridge converters with R, R-L, R-L-E load, Three phase uncontrolled & controlled rectifier, triggering schemes, flyback diode, effect of source inductance.	9	CO2
III	**DC – DC Converters:** Basic Principle of step down chopper operation with R-L Loads, control strategies-time ratio control and current limit control. Types of chopper circuits, four quadrant chopper, steady state time domain analysis of type a chopper, effect of source inductance, step up and step down Chopper, chopper circuit design.	9	CO3
IV	**Inverters :**Forced commutated inverters, single phase voltage source inverters, Half bridge inverter, full bridge inverter (with R and RL load), steady state analysis, voltage control in single phase inverters, 3-phase bridge inverters (with R and RL load) 120, 150 and 180 mode, pulse width modulated inverters, harmonics reduction techniques, current source inverter, inverter circuit design. (Voltage & frequency control)	8	CO4
V	**AC Voltage Controllers and Cycloconverters:** Principle of AC voltage controllers-phase control and integral cycle control, types of AC voltage controllers, single-phase and three-phase AC controllers with R and RL loads, fan and temperature control. **Cyclo-converter:** Principles of operation, advantages, disadvantages and applications of single/three cycloconverters on R and RL load.	7	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of experiments:

1. To study various static switches (SCR, TRIAC, DIAC, IGBT and MOSFET) and their control. (CO1)
2. To study R and RC based triggering circuits for thyristor.
3. Design a relaxation oscillator circuit using Unijunction Transistor (UJT) to be used as a firing circuit for single-phase phase controlled rectifiers.
4. To study the phase control of TRIAC using DIAC & RC circuit.
5. To study single phase half controlled rectifier configurations for R and RL loads.
6. To study single phase half controlled rectifier configurations for RLE loads.
7. To study single phase fully controlled rectifier configurations for R and RL loads.
8. To study three phase fully controlled rectifier configurations for R and RL loads.
9. To study the working of step up chopper.
10. To study the working of 180 degree inverter circuit.

Text Book-

1. Power Electronics", P.S. Bimbhra, Khanna Pub.
2. Power Electronics Circuits and MATLAB simulations", Alok Jain, Penram International Pub.(India) Pvt.Ltd.

Reference Books-

3. "Power Electronics converters, Applications and Design", Ned Mohan, T.M. Undeland and W.P. Robbins, Wiley India Pvt.Ltd.
4. "Power Electronics Circuits, Devices and Applications", M.H. Rashid, Pearson Education Pvt.Ltd.
5. Power Electronics Principles and Applications, Joseph vithayathil, McGraw Hill Education India P. Ltd
6. Power Electronics : Essentials & Applications, L. Umanand, Wiley India Pvt Ltd
7. "Power Electronics and Variable Frequency Drives", Bimal K.Bose, IEEE Press.
8. "Power Electronics Systems: Theory and Design", Jai P. Agrawal, Pearson Education Pvt.Ltd.

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assg (10)	Quiz (10)	Total (100)
Practical (30)	Lab work (10)	Quiz (10)	-	Total (50)

List/Links of e-learning resource

- NPTEL

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	
Compiled and designed by	Dr. Monika Jain
Subject handled by department	Electrical Engg. Department

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Department of Electrical Engineering

Semester/Year		IV/II	Program		B.Tech
Subject Category	DE	Subject Code:	EE- 503	Subject Name:	Power system -II

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Fundamental knowledge of Basic Electrical Engineering and Power system -I

Course Objective:

- To understand the transmission system of Electric power system,
- To inculcate the performance and analysis of Transmission lines
- To impart knowledge of current trends in Power system

Course Outcomes:

CO1. Evaluate transmission line parameters.
CO2. To analyse the performance and modeling of transmission lines.
CO3. To understand factors governing the performance of transmission lines and its compensation.
CO4. Describing various compensating techniques in detail.
CO5. Describe various trends in power system transmission.

UNITs	Descriptions	Hrs.	CO's
I	**Transmission Line Parameters-** Resistance, inductance and capacitance of single and three phase lines with symmetrical and unsymmetrical spacing transposition, charging current, skin effect and proximity effect, concept of GMR & GMD.	8	CO1
II	**Performance of Transmission Lines-** Analysis of short, medium and long lines, equivalent circuit, representation of the lines and calculation of transmission parameters, Power flow through transmission line, Power circle diagram. Sag and stress calculation of transmission lines.	8	CO2

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III	**Factors Governing the Performance of Transmission** Description and effect on Resistance of Solid Conductors -Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Power loss due to corona, Practical importance of corona, Use of bundled conductors.	8	CO3
IV	**Compensating Techniques -** Introduction, Types of compensation techniques, shunt compensation, Series compensation, Basic concepts of reactive power compensation, Improvement of system performance due to reactive power compensation.	8	C04
V	**Current trends in Power system**- Introduction to High Voltage DC transmission, Layout of HVDC station, Advantages of HVDC transmission, Introduction to Flexible AC Transmission System (FACTS),Brief description of FACTS controllers.	8	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of Experiments.

NA

Text Book-

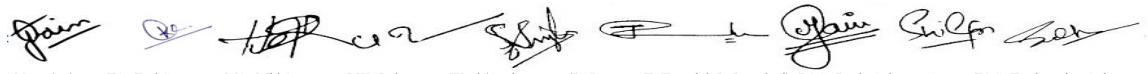
1. Power System Analysis by Hadi Saadat – TMH Edition, 2009
2. I.J.Nagrath and D.P. Kothari, "Modern Power System Analysis", Tata McGraw Hill, fourth edition, 2011.

Reference Books-

1. D. Das "Electrical Power Systems", New Age International Publishers, 2006.
2. J.J. Grainger and W.D Stevenson, "Power System Analysis", McGraw Hill, 1994.
3. Principles of Power System: V. K. Mehta, Rohit Mehta, S. Chand Publications
4. Power System Analysis and Design: J. Duncan Glover, Thomas J. Overbye, Mulukutla S. Sarma, Cengage Learning India Pvt. Ltd.
5. Padiyar K. R., "HVDC Power Transmission System", New Age International Private Limited.
6. Hingorani N. G. and Gyugyi L., "Understanding FACTS", IEEE Press, Standard Publishers Distributors.
7. A Course In Power Systems - J.B. Gupta

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assg (10)	Quiz (10)	Total (100)
Practical (30)	Lab work (10)	Quiz (10)	-	Total (50)



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List/Links of e-learning resource www.youtube.com/watch?v=lr1jgbR5ca8&list=PLD4ED2FAF3C155625&index=10 https://www.youtube.com/watch?v=6HthEBz3HBw https://www.youtube.com/playlist?list=PLFUp6Kl88lkMtoP5183KD87TlE0zesFuy https://www.youtube.com/watch?v=G5xyHSBHcxQ https://www.youtube.com/watch?v=pyvsQswswjQ	
NPTEL/Moocs https://nptel.ac.in/courses/108102047 https://nptel.ac.in/courses/108105067	
Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	
Compiled and designed by	Dr. Shilpi Tomar
Subject handled by department	Electrical Engineering

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BOS Date: 19th June 2024

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Electrical Engineering

Semester/Year		III /II	Program		B.Tech
Subject Category	Departmental Course	Subject Code:	EE-504	Subject Name:	Microprocessor & Micro Controller

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	-	4

Prerequisites:

Digital Electronics , Analog Electronics

Course Objective:

1) To omit the students to understand importance of microprocessor in calculation & in automation.
2) To impart the knowledge of 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.

Course Outcomes:

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

CO1. Understand Intel 8085 architecture, instruction set, and assembly language programming.
CO2. Explain Intel 8086 architecture, instruction set, and assembly language programming.
CO3. Interface IC 8255 and IC 8251 with 8-bit and 16-bit microprocessors.
CO4. Describe programmable timer 8254, DMA controller 8257, and interfacing DAC/ADC chips.
CO5. Understand Intel 8051 microcontroller architecture, instruction set, and embedded system design.

Units	Descriptions	Hrs.	CO's
I	Microprocessor concepts, architecture of Intel 8 bit microprocessor 8085, pin diagram, pin function Instruction set, Interrupts, and assembly language programming, Addressing modes.	9	CO1

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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.	6	CO2
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.	9	CO3
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.	8	CO4
V	Intel 8 bit microcontroller and register set, instruction set, interrupts, counter and timing operations of 8051, Addressing modes. **Introduction To Embedded Systems** - Complex systems and micro processors– Embedded system design process – Instruction sets preliminaries - ARM Processor – CPU: programming input and output supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance.	8	CO5
Expert Lecture			
Total Hours		40	
Suggestive list of experiments:			

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

Text Book-

1. Microprocessor Architecture, Programming, and Applications with the 8085" by Ramesh S. Gaonkar
2. "The 8086 Microprocessor: Programming & Interfacing the PC" by Kenneth Ayala
3. "The 8051 Microcontroller and Embedded Systems: Using Assembly and C" by Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin McKinlay
4. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, 3rd Edition “Morgan Kaufmann Publisher (An imprint from Elsevier), 2012

Reference Books-

1. Microprocessors and Interfacing: Programming and Hardware" by Douglas V. Hall
2. "Advanced Microprocessors and Peripherals" by A.K. Ray and K.M. Bhurchandi
3. "Embedded Systems: Introduction to ARM Cortex-M Microcontrollers" by Jonathan W. Valvano
4. Jonathan W. Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, 3 rd Edition, Cengage Learning, 2012
5. David. E. Simon, “An Embedded Software Primer”, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007

Modes of Evaluation and Rubric

Abbreviations: ES -End Semester, MS- Mid Semester, LW- Laboratory Work/Assignment. (L: Lecture, T: Tutorial, P: Practical), BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanities Science and Management Course, MAC- Mandatory, Audit Course, AC- Audit Course, HEC- Holistic Education Courses: NSS/NCC/NSO, ITC- Information Technology Course, ILC-Institute Level Course, DC- Department Course, DE-Department Elective, OC- Open Course, DLC- Department Laboratory, PROJ- Project Work, VA-Value Added Course

Theory (60)	Midsem (20)	Assg (10)	Quiz (10)	Total (100)
Practical (30)	Lab work (10)	Quiz (10)	-	Total (50)

List/Links of e-learning resource	
• NPTEL	
Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	
Compiled and designed by	Dr. Jitendra Kumar Tandekar
Subject handled by department	Electrical Engg.

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(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Electrical Engineering

Semester/Year		IV/II	Program		B.Tech
Subject Category	DL	Subject Code:	DL	Subject Name:	Lab- Machine Design

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
-	-	-	-	30	10	10	50			4	**2**

Prerequisites:

Electrical Machine, Electrical Engg. Drawing

Course Objective:

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.

Course Outcomes:

CO1: Understand and apply the fundamental principles and considerations in the design of various electrical machines, including material selection, limitations, and specific loadings.CO2: Design the main dimensions, armature slots, and windings for salient and non-salient pole synchronous machines.

CO2: Design the main dimensions, armature slot dimensions, commutator, brushes, magnetic circuits, and field windings of DC machines, including estimation of ampere turns and yoke and pole design.

CO3 : Derive and apply the output equations for single-phase and three-phase transformers, design core dimensions and windings, estimate no-load current and leakage reactance, and design transformer tanks and cooling systems.

CO4: Design the main dimensions, stator and rotor components, air gap length, and windings for three-phase induction motors, and estimate performance parameters such as no-load current and leakage reactance.

CO5: Design the main dimensions, armature slots, windings, and rotor components for both salient and non-salient pole synchronous machines, including the magnetic circuits, field windings, and short circuit ratio analysis.

UNITs	Descriptions	Hrs.	CO's

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I	**PRINCIPLES OF ELECTRICAL MACHINE DESIGN:** Introduction, considerations for the design of electrical machines, limitations. Different types of materials and insulators used in electrical machines.		CO1
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.		CO2
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)		CO3
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.		C04
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		CO5
Expert Lecture			
Total Hours			
Suggestive 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.
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.
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.
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.
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. Design and construct the stator and rotor of a small induction motor, including slot estimation and winding. Measure the performance parameters.
10. Design and construct a small DC motor, focusing on the main dimensions, armature slots, commutator, and brushes. Measure the performance parameters

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- Performance And Design Of AC Machines, M.G.Say,CBS Publishers and Distributors Pvt.Ltd. Design Data Handbook, A. Shanmugasundarm, G,Gangadharan,R.Palani,Wiley Eastern Ltd.
Modes of Evaluation and Rubric

Practical (30)	Attendance (10)	Viva/lab performance (10)		Total (50)

List/Links of e-learning resource	
NPTEL/Moocs	
Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	
Compiled and designed by	Prof. Shivendra Singh Thakur
Subject handled by department	Electrical Engineering

Abbreviations: ES -End Semester, MS- Mid Semester, LW- Laboratory Work/Assignment. (L: Lecture, T: Tutorial, P: Practical), BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanities Science and Management Course, MAC- Mandatory, Audit Course, AC- Audit Course, HEC- Holistic Education Courses: NSS/NCC/NSO, ITC- Information Technology Course, ILC-Institute Level Course, DC- Department Course, DE-Department Elective, OC- Open Course, DLC- Department Laboratory, PROJ- Project Work, VA-Value Added Course

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Electrical Engg.

Semester/Year		V/III	Program		B.Tech
Subject Category	Open Elective	Subject Code:	OE-505(A)	Subject Name:	Control System

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	-	-	**3**

Prerequisites:

Dynamics; Differential equations; Laplace transforms; basic Electrical circuits

Course Objective:

1. To illustrate the students with concepts of block diagrams and transfer functions.
2. To explain the students characteristics of closed-loop control systems, including steady-state and transient response, parametric sensitivity, disturbances, error, and stability.
3. To classify the basic performance criteria for first and second order systems.
4. To teach students basic control system design methods, including root locus diagrams and frequency response methods.
5. Explain students to the basic concepts of proportional, integral, and derivative (PID) control.
6. Illustrate the students to existing software tools used for control system design.

Course Outcomes:

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

CO1: Acquire knowledge and understand of different types of systems and their representation, stability, time domain and frequency domain behaviour controllers and compensators to obtain mathematics.

CO 2: Apply knowledge to obtain mathematical modeling of different systems, find out transfer function and obtain knowledge, signal flow graph and state space representation.

CO 3: Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.

CO 4: Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO 5: Design feedback controllers and compensation circuits &develop and analyze state space models.

UNITs	Descriptions	Hrs.	CO's

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I	Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra. Signal flow graph, Mason's formula, Error detectors (Synchros& Potentiometer), Servomotors (AC & DC), techo-generators.	10	CO1
II	Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Steady state error & error constants.	8	CO2
III	Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci. Effect of adding poles and Zeros on the loci, Stability by root loci.	8	CO3
IV	Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.	7	CO4
V	Design of control systems with PD/PI/PID Control in time domain and Frequency domain, leadlag, Lag-lead compensation, Design of compensating networks. Solution of state equation: Eigen values & eigenvectors digitalization state transitive matrix	7	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of experiments:

NA

Text Book-

1. B.S. Manke Linear control system Khan Publisher.
2. S. Hassan Squeed Automatic Control system, Katson Book.

Reference Books-

1. I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
2. K. Ogata, Modern Control Engineering, PHI.
3. B.C. Kuo, Automatic Control systems, PHI
4. Gopal M., Control System : Principles & Design, TMH.
5. N.K. Sinha, Control Systems, New Age International
6. Stefani, Shahian, Savant, Hostetter – "Design of feedback control System's", Oxford.
7. Bishop and Dorf, Modern Control System, Pearson

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assg (10)	Quiz (10)	Total (100)

List/Links of e-learning resource

- NPTEL

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	
Compiled and designed by	Prof. Sudhir Sharma
Subject handled by department	Electrical Engg.

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SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Electrical Engineering

Semester/Year		IV/II	Program		B.Tech
Subject Category	OE	Subject Code:	OE- 505(B)	Subject Name:	Power Generation Technologies

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Fundamental knowledge of Basic Electrical Engineering and Power system -I

Course Objective:

Is to provide the knowledge about the electrical power generation from conventional energy sources and cost of the electrical power.

Course Outcomes:

CO1. Describe sources of energy and types of power plants.
CO2. Enumerate the solar power generation and its types.
CO3. Illustrate the advantages and disadvantages of hydel power plant
CO4. Describing wind power generation and its turbines briefing.
CO5. Estimate the cost of electrical energy consumed

UNITs	Descriptions	Hrs.	CO's
I	**Introduction:** Electric power generation scenario in INDIA from Conventional and non conventional sources of energy. Advantages and disadvantages with conventional and non-conventional energy sources.	4	CO1
II	Solar Power generation : Introduction, Why Solar Energy generation, Solar Photovoltaic energy conversion and utilization, solar power generation systems a) off-grid systems b) grid connected systems c) power control and management systems, economics of solar photovoltaic systems, World Energy Requirement.	9	CO2

III	**Hydro Electric Station** :Site selection, Hydrology, storage and pondage, general arrangements and operation of hydro power plant, Hydraulic turbines, turbine size, pelton wheel turbine, Francis and Kaplan turbines, selection of turbines, Dams, Spillways, gates, intake and out take works, canals and layout of penstocks, water hammer and surge tank, simple numerical on hydrographs and number of turbine required. Control of hydro turbines. Small, mini and micro hydro power plant, Recent Development in hydro power plants	9	CO3
IV	**Wind Energy systems:** Historical Development of Wind Power, Types of wind turbine electrical generators, Wind turbine power converters (block diagrams), Wind Turbine Economics, Simple Estimates of Wind Turbine Energy, Environmental Impacts of Wind Turbines.	9	C04
V	**Tariff** : Electrical energy calculation in units. Cost of electrical energy, load factor and demand factor, Different types of Tariff methods with its applicability.	9	CO5
Expert Lecture		1	
Total Hours		40	

List of Experiment

NA

Text Book-

1.M.L.Soni,P.V Gupta,U.S Bhatnagar and A.Chakraborti "A text book on Power System Engineering" Dhanpat Rai & Co.Pvt.Ltd.1999.

2. V.K Mehta and Rohit Mehta "Principles of Power Systems" S.Chand & company LTD, New Delhi 2004.

Reference Books-

1. S.N.Singh "Electrical Power Generation, Transmission and Distribution",PHI, 2003.

2. GD Rai "Non Conventional Energy Sources "Khanna Publishers, 4th edition 2000.

3.Mukund Patel, "Wind and Solar Power Plants", CRC Press.

4.R.K. Rajput, "Non-Conventional Energy Sources and Utilization", S. Chand Publications.

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assg (10)	Quiz (10)	Total (100)

List/Links of e-learning resource

https://online.vtu.ac.in/course-details/Power-Plant-Engineering

NPTEL/Moocs

https://onlinecourses.nptel.ac.in/noc20_me10/preview

https://onlinecourses.nptel.ac.in/noc20_ph14/preview

https://archive.nptel.ac.in/courses/103/103/103103206/

Recommendation by Board of studies on	19th June 2024

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Approval by Academic council on	
Compiled and designed by	Dr. Shilpi Tomar
Subject handled by department	Electrical Engineering

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