MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous Institute Affiliated to R.G.P.V., Bhopal MP)
Electrical Engineering Department

Scheme & Syllabus

2014 onwards

ME

in

Industrial Systems & Drives

Electrical Engineering Department
Madhav Institute of Technology & Science
Gwalior-474005

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute Affiliated to R.G.P.V., Bhopal MP)

Electrical Engineering Department

M.E. I Semester

Industrial Systems & Drives

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code Old	Subject Code New	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits	Remark
				Theory Slot			Practical Slot							
				End sem	Mid sem	Quiz/ Assignment	End Sem	Lab work/ sessional		L	T	P		
1.	**MISL911**	**580101**	Computational Techniques	70	20	10	-	-	100	3	1	-	4	
2.	**MISL912**	**580102**	Static Power Converters	70	20	10	-	-	100	3	1	-	4	
3.	**MISL913**	**580103**	Advanced Microprocessors and Applications	70	20	10	-	-	100	3	1	-	4	
4.	**MISL914**	**580104**	Advanced Control System	70	20	10	-	-	100	3	1	-	4	
5.	**MISL915 (i)**	**580105**	Elective-I (i) Power Quality and FACTS Controllers	70	20	10	-	-	100	3	1	-	4	
6.	**MISL915 (ii)**	**580106**	Elective-I (ii) High Voltage Industrial Practices											
7.	**MISP916**	**580107**	Systems & Drives Lab-I	-	-	-	90	60	**150**	-	-	6	6	
8.	**MISP917**	**580108**	Computer Simulation Lab-I	-	-	-	90	60	**150**	-	-	6	6	
			Total	**350**	**100**	**50**	**180**	**120**	**800**	**15**	**5**	**12**	**32**	**800**

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Electrical Engineering Department

M.E. II Semester

Industrial Systems & Drives

Subject wise distribution of marks and corresponding credits

S.No.	Subject Code Old	Subject Code New	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per week			Total Credits	Remarks
				Theory Slot			Practical Slot							
				End sem	Mid sem	Quiz/ Assignment	End Sem	Lab work/ sessional		L	T	P		
1.	**MISL921**	**580201**	Advanced Power Electronics	70	20	10	-	-	100	3	1	-	4	
2.	**MISL922**	**580202**	Computer Aided Protection	70	20	10	-	-	100	3	1	-	4	
3.	**MISL923**	**580203**	Modeling Simulation and Evolutionary Techniques	70	20	10	-	-	100	3	1	-	4	
4.	**MISL924**	**580204**	Electrical Machine Modeling and Drives	70	20	10	-	-	100	3	1	-	4	
5.	**MISL925 (i)**	**580205**	Elective –II (i)Restructured Power System	70	20	10	-	-	100	3	1	-	4	
6.	**MISL925 (ii)**	**580206**	Elective –II (ii) Digital Signal Processing											
7.	**MISP 926**	**580207**	Systems & Drives Lab–II	-	-	-	90	60	150	-	-	6	6	
8.	**MISP 927**	**580208**	Computer Simulation Lab-II	-	-	-	90	60	150	-	-	6	6	
			Total	**350**	**100**	**50**	**180**	**120**	**800**	**15**	**5**	**12**	**32**	**800**

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Electrical Engineering Department

ME (Third Semester)

Industrial Systems & Drives

Subject wise Distribution of Marks and Corresponding Credits

S. No.	Subject Code	Subject Code New	Subject Name	Period Per Week			Credits	Maximum Marks (Theory Slot)			Maximum Marks (Practical Slot)		Total Marks
				L	T	P		End Sem. Exam	Tests (Two)	Assign-ments/ Quiz	End Sem. Practical / Viva	Practical Record/ Assignment/ Quiz/ Presentation	
1	**MISL931**	**580301**	Semiconductor Controlled Drives	3	1	-	4	70	20	10	-	-	**100**
2	Elective –III (Any One)			3	1	-	4	70	20	10	-	-	**100**
	MISL 932(i)	**580302**	Industrial Instrumentation										
	MISL 932(ii)	**580303**	Fuzzy Control										
	MISL 932(iii)	**580304**	Power System Instrumentation and Control										
	MISL 932(iv)	**580305**	Power System Analysis & Control										
3	**MISP 933**	**580306**	Industrial Training	-	-	4	4	-	-	-	-	100	**100**
4	**MISP 934**	**580307**	Prelim Dissertation	-	-	8	8	-	-	-	120	80	**200**
Total				**6**	**2**	**12**	**20**	**140**	**40**	**20**	**120**	**180**	**500**

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Electrical Engineering Department

ME (Forth Semester)

Industrial Systems & Drives

Subject wise Distribution of Marks and Corresponding Credits

S. No.	Subject Code	Subject Code New	Subject Name	Period Per Week		Credits		Maximum Marks (Theory Slot)			Maximum Marks (Practical Slot)		Total Marks
				L	T	P		End Sem. Exam	Tests (Two)	Assignments / Quiz	End Sem. Practical/ Viva	Practical Record/ Assignment/ Quiz/ Presentation	
1	**MISP 941**	**580401**	**Dissertation Evaluation & Defense**	-	-	20	20	-	-	-	300	200	**500**
Total				**-**	**-**	**20**	**20**	**-**			**300**	**200**	**500**

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Electrical Engineering Department

MISL 911/ 580101 (New)
Computational Techniques

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives

- To perceive the Z-transform techniques
- To describe random sampling and hypothetical test
- To know about the formulation of L.P.P., Non-LPP and its applications
- To explore the Queueing models and System Reliability
- To know about the Game theory.

Unit 1:Integral transform
Z-transform and their properties, inverse Z-transform, convolution theorem, solution of difference equations by Z-transform. Basic concept of Bessel's function, Hankel transform and their properties, Parseval's theorem.

Unit 2:Analysis of variance & chi-square distribution:
Introduction, Random sampling, Testing of Hypothesis, Chi-square (χ^2) Test, Analysis of variance one way classification, two-way classification.

Unit 3:Linear programming and non-linear programming:
Formulation of L P..P., Graphical method for solving with two variables, Simplex method, Duality theory, Transportation and Assignment problems. Concept of Non LPP, Bellman's principles of optimality. Dynamic programming approach in decision making problems, optimal sub-division problems.

Unit 4:Queueing and Reliability theory:
Introduction, Basic queuing process, important definitions in queuing problem, classification of queuing models, Model (M/M/1) : (∞/FCFS) and (M/M/1) : (N/FCFS), (M/M/S) : (∞/FCFS), Definition of reliability, Hazard rate, Mean time to failure, reliability of series, Parallel and redundant systems.

Unit 5:Game theory:
Introduction, competitive games, finite and infinite games, two person Zero sum game, pure and mixed strategies, saddle point, Maximin and Minimax principle, solution of a rectangular game in terms of mixed strategies. Graphical method of (2xm) and (nx2) games.

Reference & Text Books:
H. A. Taha: Operations Research an Introduction
F. B. Hildebrand: Methods of Applied Mathematics
H. C. Saxena, S. Chand: Statistics
Roy Billinton & Ronald N. Allan: Reliability Evaluation of Engineering Systems: Concepts and Techniques
I.Griva, S. G. Nash and A. Sofer: Linear and Non- Linear Optimization.

Course Outcome:

After completing this course, the students will be able to:

CO1 : Develop an ability to apply Linear Programming Problems and Non Linear Programming Problems.
CO2 : Evaluate system reliability for specific problem.
CO3 : Apply the different statistical tool to analyze the data
CO4 : Develop the skill to solve real-world problems using Queueing models
CO5 : Perform the hypothetical test for better approximation
CO6 : Apply Game theory techniques

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MISL-912(O)/ 580102 (New)
STATIC POWER CONVERTERS

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives

- To introduce students the basic theory of power semiconductor devices and passive components, their practical application in power electronics.
- To familiarize the operation principle of AC-DC, DC-DC, DC-AC conversion circuits and their applications.
- To provide the basis for further study of power electronics circuits and systems.

Unit 1: Power semi-conductor Devices, Characteristics and rating of thyristor, Power Diodes, Power Transistors, TRIAC, MOSFETs ,GTOs, IGBT, MCT Firing circuit and Commutation techniques.

Unit 2: Introduction of Uncontrolled & controlled AC to DC Converters, Performance improvement of AC to DC Converters, Controlled Fly-wheeling, Extinction Angle control, Symmetrical Angle control, pulse-width –modulation control & Sinusoidal Pulse-width–Modulation, Dual Converter.

Unit 3: Cyclo-Converters, single Phase & three phase cyclo–Converters, circulating and non-Circulating modes of operation.

Unit 4:DC to DC Converters: Study of single and multi-quadrant Chopper, Linear power supply and Switch Mode power Supply (SMPS), Isolated and Non-Isolated Switch Mode DC-DC Converter topologies, PFC converters and Resonant Converters. Design of feedback controllers for dc-dc converters.

Unit 5: Inverters: Voltage Source Inverter, Current Source Inverter and their Comparison, Six-step Inverter, PWM Inverter, various PWM schemes, Harmonic analysis.

Reference & Text Books:

1. Power Electronics – Ned. Mohan, John Wiley & Sons, Inc.
2. Power Electronics Circuits, Devices, and Applications by M.H. Rashid, Prentice Hall
3. A Text book of Power Elctronics by S.N. Singh, Dhanpat Rai Publication
4. Power Electronics by Dr. P.S. Bhimbra (III Edition) Khanna Publication
5. Power Electronics by Cyril W.Lander , TMH Publishers
6. Power Electronics by Josheph Vidyathil, TMH Publishers

Course Outcome:

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

CO1 Name power electronics devices and explain their characteristics (static/ dynamic).
CO2 Describe the architecture of AC to DC converter, Dual converter, chopper, cyclo-converter.
CO3 Classify converters and identify their applications.
CO4 Develop model of converters to compute their performance parameter
CO5 Apply the models for computing the output parameters of various converters.
CO6 Identify the problems/limitations of power electronics devices, converters and suggest solution.

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MISL/MMCL -913(O)/580103 (New)
ADVANCED MICROPROCESSORS AND APPLICATIONS

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives

- To emphasizes on micro-processor and microcontroller fundamentals and applications.
- To study selected architecture
- To programmed in Assembler and a high level language.

Unit 1: Review of 8 bit microprocessor (Intel 8085), pin configuration, internal architecture, addressing modes, Instruction set, instruction timing diagram, Programming concepts, assembler directives, memory interfacing and interrupts.

Unit2: 16 bit microprocessor (Intel 8086), pin configuration, internal architecture, bus interface unit, execution unit, register organization, memory organization, addressing modes, Instruction set, assembler directives, instruction timing diagram, concepts of pipelining, and interrupts.

Unit3: Architecture and pin configuration of Motorola 6800 and 68000, Intel 80186, 80286, 80386, and 80486. Architecture and pin configuration of numeric co-processor 8087.

Unit 4: Programming support clips viz 8255 PPI, 8251 serial communication interface chips, 8259 interrupt controller, , 8253/8254 Interval timer, their operation and interface with 8086 microprocessor. 8279 Interfacing of key board/Display, DMA controller 8257, dot matrix printer controller 8259.

Unit 5: Introduction to microcontroller 8051, Architecture, pin description, timer/counter function, addressing modes, instruction set. 8051 interfacing to ADC and DAC, Stepper motor interfacing, DC motor interfacing, control traffic light, temperature control.
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Text and Reference Books:

1. Advanced Microprocessor and Interfacing: D.V. Hall, TMH
2. Advance Microprocessor and Peripheral: Ray A.K., Bhurchandi K.M., TMH.
3. Introduction to Microprocessor: A.P. Mathur, TMH
4. Microprocessor & Microcontrollers: Raffiquzzaman, Galgotiya Publication
5. The 8086 Microprocessor: Programming and Interfacing the PC :Kenneth J. Ayala
6. The 8051 Microcontroller Architecture, Programming & Application: K.J. Ayala, Pearson Education
7. Microprocessor Architecture, Programming and Applications by Gaonkar, Wiley Eastern Ltd.
8. The 8051 Microcontroller and Embedded Systems:Muhammad Ali Mazidi and Janice Gillespie Mazidi,
9. 8051 Microcontroller: V.Udayashankara and M.S.Mallikarjunaswamy, TMH

❖ Course Outcomes:

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

CO1 Acquaint the Architecture and Pin diagram of Micro-processor and Microcontroller.
CO2 Develop program in assembly language for real time applications.
CO3 Differentiate between microprocessors and microcontrollers and their applications.
CO4 Analyze and Identify the different ways of interfacing memory and I/O with microprocessors.
CO5 Use interrupts operation in Microprocessor.
CO6 Demonstrate the interfacing of various peripheral devices with the microprocessor & Microcontroller.

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MISL/MMCL-914(O)/ 580104(New)
ADVANCED CONTROL SYSTEMS

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To develop skills for modeling, design and analysis of physical systems, through the concepts of transfer function and state space approach and to understand the implications of system stability.
- To provide the basic knowledge of control system analysis and design tools with emphasis on computer aided design
- To learn the role of a control engineer in multi-disciplinary teams.

UNIT-I: Time & frequency response analysis:Time Domain analysis, Design of PID controllers, Frequency Domain analysis, Design of Compensator

UNIT-2: State space analysis:State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms– Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form. Tests for controllability and observability for continuous time .

UNIT 3: Non linear control:Introduction to nonlinear systems, Types of nonlinearities, describing function analysis of nonlinear control systems. Introduction to phase-plane analysis.Stability analysis**:** Stability in the sense of Lyapunov., Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.

UNIT4: Modal control**:** Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer, Practical Industrial applications and examples.

UNIT5: Calculus of variations:Minimization of functionals of single function, Constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrangine Equation.

Text and Reference Books:

1. Control System Engineering by I.J. Nagrath & M. Gopal, (III Edition), New Age International Publishers.
2. Modern Control Engineering by K. Ogata (IV Edition), Pearson Education Pvt. Ltd.
3. Control System by B.C. Kuo (VII Edition), Prentice Hall of India Pvt. Ltd.
4. Linear Multivariable Control Theory by Y.S. Apte, (Tata Mcgraw Hill Publishing Company Limited).
5. Control and Dynamic system by C.T. Leondes, (Harcount Brace Jovanovich publishers Newyork.
6. Modern control Theory by W.L. Grogan, (Quantum Publishers Inc., USA) .
7. Linear Control System by Edwin C.Barbe, (International Textbook Company- Scranton,Pennsylvania).
8. Elements of Control System by Sudhir Gupta, Prentice Hall of India Pvt. Ltd.
9. Control System Engineering: Theory & Practice by M.N. Bandhopadhyay PHI Pvt. Ltd.
10. Modern control systems; Dorf &Bishop(pearson)

Course Outcomes:

At the completion of this course, the student will be able to:

CO1 Describe quantitatively the transient response and frequency response of linear time invariant systems
CO2 Represent any system by state space model for analysing any kind of system
CO3 Apply comprehensive stability criteria of linear and non linear system
CO4 Design controller to meet the system performance in state space domain
CO5 Understand practical optimization problems
CO6 Exhibit critical and creative thinking skills for analysis and evaluation of problems and cause-effect relationships

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MISL/MMCL-915(i)(O)/580105(New)
POWER QUALITY &FACTS CONTROLLERS

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To provide detailed knowledge of power quality, series and shunt compensation, various types of FACTS controllers, their Applications and placement and sizing.
- To introduce the concepts of Distributed Generation, its impact on Power quality, smart grid and microgrid.

Unit I

Power Quality: Overview and definition of power quality, Sources of pollution, concepts of linear and nonlinear loads. International power quality / EMC standards and regulations. Power quality problems: Sag and Swells, rapid voltage fluctuations, voltage unbalances, transient over-voltages, short and long duration outages etc.

Unit II

Power System Harmonics: Overview of sources of harmonic, Harmonic analysis, Effects of Harmonic on power system devices. Distributed Generation: Introduction and general impact of distributed generation on Power quality. Harmonic mitigation techniques.

Unit III

Compensation in power systems: Introduction, Fundamental concepts in Reactive Power, requirement for compensation: load compensation and line compensation, Reactive Power Compensation Principles**:** Shunt Compensation, Series Compensation, Traditional Var Generators:Fixed or mechanically switched capacitors and Synchronous Condensers, Thyristorized Var Compensators.

Unit IV

Flexible AC Transmission System: Introduction, Shunt FACTS Controllers: Static Var Compensator (SVC), Static Synchronous Compensator (STATCOM), Series FACTS Controllers : Thyristor Controlled Series Compensator (TCSC), Thyristor Controlled Phase Shifting Transformer (TCPS), Synchronous Series Compensator (SSSC), Unified Power Flow Controller (UPFC).

Unit V

Placement and Applications of FACTS Controllers : Placement of FACTS Controllers, Sizing of FACTS Controllers, Steady State Applications: Voltage Control, Increase Thermal Loading, Post Contingency Voltage Control, Loop Flows, Short-Circuit Level and Power Flow Control, Dynamic Applications: Transient Stability Improvement, Oscillation Damping and Voltage Stability Enhancement, Technical Benefits of FACTS Controllers.

Recommended Books:

1. Electrical Power System Quality: R. C. Dugan, McGraw Hill Publication
2. Power Electronics Handbook: Devices, Circuits and Applications, M.H. Rashid, Butterworth-Heinemann, 3rd Edition, 2011
3. Understanding FACTS: Concepts and Technologies of Flexible AC Transmission System- N.G. Hingorani, L. Gyugyi, IEEE Press, 2001
4. Thyristor-Based FACTS controllers for Electrical Transmission systems- R.M.Mathur, R.K. Verma, Wiley Interscience, 2002
5. Power Quality: C. Sankaran, CRC Press
6. Power System Operation and Control- N. V. Ramana, Pearson Education India

Course Outcomes:

After completing the course, the students will be able to-

CO1	Describe Power Quality issues, their origin, monitoring and mitigation methods, Distributed Generation.
CO2	Analyze the effects of various power quality phenomenon in various equipments and impact of DG on power quality.
CO3	Describe the significance of shunt, series compensation and role of FACTS devices on power system control.
CO4	Classify various types of VAR generators and FACTS controllers.
CO5	DescribeSteady State & Dynamic Applications of FACTS Controllers, Smart grid and microgrid.
CO6	Solve Placement & Sizing problem of FACTS Controllers

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MISL/MMCL-915(ii)(O)/580106(New)
HIGH VOLTAGE INDUSTRIAL PRACTICES

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To familiarize the students with high voltage generation and test equipments.
- To handle various high voltage apparatus and operate them in range

Unit I Generation of High Voltage: Different methods of Generation of A.C., D.C., and Impulse High Voltage, Circuits for double exponential Impulse and switching surge Generation fast Switching, Analysis of Impulse waveform and Generator efficiency.

Unit II High Voltage Measurement: Review of Measurement methods, Electrostatic Voltmeter Compensated Dividers at power frequency, Divider for Impulse waveform, Divider at power frequency. Divider compensation critical High Voltage and current measurement, Optical signal links.

Unit III Industrial application of High Voltage Engineering: Electrostatic precipitator, spraying of liquid and power coating, Mineral Separation, Electrostatic Precipitation and printing Electrostatic hazards, Electron Microscope, X-ray Generation, Pulse power application, High power Electron beams for melting, welding etc, Application in space vehicles, Medical applications. Insulation Engineering.

Unit IV Concepts of Electric stress, Dielectric Electric strength, Electric breakdown in vacuum, Gases, Liquids, Solids and dielectrics, testing in Solids, Insulation system in bushing, Transformers, Cables, Capacitors and Circuit breakers. Techniques of Electrical non-destructive evaluation of Material breakdown tests and measurement.

Unit V High Voltage Test & Specifications: Over voltage tests, Impulse test and routines interference test, Partial Discharge test, Test methods, Test on H.V.D.C. Equipment. High Voltage Switchgears: HVDC breakers, Harmonic Capacitors Switches, EHV Disconnecting switches, Corona and Corona losses, Earthing and Shielding of EHV System.

Reference & Text Books:

1. High Voltage Engineering by Dr. M.P. Chourasia Khanna Publisher Delhi.
2. High Voltage Engineering by E. Kuffel & W.S. Zaengl, J. Kuffel, Newnes , New Delhi.
3. High Voltage Engineering by M.S. Naidu, V. Kamraju Tata McGraw Hill, New Delhi.
4.High Voltage Engineering by C.L. Wadhwa, New Age International Ltd. ,New Delhi.
5. An Introduction to High Voltage Engineering by Subir Ray, Prentice Hall of India Pvt. Ltd.

Course Outcomes:

After completing this course the student will be able to know

- CO1 Understanding the basics of high voltage and its application
- CO2 Appreciate the design, principles and critical elements of a high voltage system.
- CO3 Ability to identify problems in order to generate solution for various engineering problem related to high voltage engineering.
- CO4 Learning the techniques to generate high voltage.
- CO5 Study of electric field problems, the behavior of insulating materials under the stress of high electrical voltage.
- CO6 The ability to test them electrically for forming high voltage equipments and insulation systems
- CO7 Introduce the working principles, planning, operation, testing and maintenance of high voltage equipment and systems.

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MISL/MMCL-915(iii)
TELEMETRY AND REMOTE CONTROL

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To understand the concepts of remote sensing, to enable selection and design of remote sensing and telemetry systems

Meanings and importance of telemetry, remote control, remote signaling and SCADA; Messages and signals; Signal formation, conversion and transmission.

Analog, pulse and digital modulation; Amplitude modulation, AM transmitter and receiver, Frequency modulation, FM transmitter and receiver, Phase modulation; Pulse modulation techniques.

Digital transmission techniques, Error detecting and correcting codes; Signal transmission media, Power line carrier communication.

Terrestrial and satellite radio links, Optical fibre communication; Multiplexing techniques; Telemetry error, D.C., pulse and digital telemetry methods and systems.

Multichannel telemetry schemes; Remote control and remote signaling, Principle of independent messages and combinatorial principle; Multi-wire, FDM and TDM remote control schemes;

Supervisory control and data acquisition; Layout, functions and operation of SCADA system; Remote terminal unit details, Control centre details, Communications in SCADA systems.

Text and Reference Books:

1. Telemetry Principles – D. Patranabis, TM
2. Telecontrol Methods and Applications of Telemetry and Remote Control – by Swoboda G., Reinhold Publishing Corp., London, 1991
3. Handbook of Telemetry and Remote Control – by Gruenberg L., McGraw Hill, New York, 1987.
4. Telemetry Engineering – by Young R.E., Little Books Ltd., London, 1988.
5. Data Communication and Teleprocessing System – by Housley T., PH Intl., Englewood Cliffs, New Jersey, 1987.

Course Outcomes:

After the completion of this course the student will be able to:

CO1 understand the basic concept of Remote Sensing
CO2 understand Telemetry and Components of Telemetering and Remote Control Systems
CO3 understand the Multiplexing
CO4 understand the Data acquisition and distribution system, Digital Modulation and demodulation Techniques in Telemetry System

MISP-916(O)/ 580108(New)

SYSTEMS & DRIVES LAB-I

List of Experiments:-

1. To observe the performance of AC phase control of SCR using different firing circuit.
2. To observe the performance of single phase AC voltage controller with lamp load.
3. To observe the performance of single phase half wave controlled rectifier with R and RL Load.
4. To observe the performance of single phase full wave controlled rectifier with R and RL Load.
5. To observe the performance of Half- Controlled bridge (semi-converter)
   (a)With Reactive load
   (b)With Reactive load and freewheeling diode.
6. To observe the performance of MOSFET based Chopper (Buck Conversion)
7. To observe the performance of SCR based Bridge Inverter
8. To observe the performance of single phase step down Cyclo-converter
9. To observe the quadrant based operation of chopper(Four quadrant)
10. Develope a simulink model of three phase 180o mode of conduction and also observe the waveforms of line voltage, phase voltage

MISP-917(O)/580109 (New)
Computer Simulation Lab-I

1. Design a Single phase full bridge rectifier with RLE load and plot the waveform of output voltage and current using MATLAB Simulink.
2. Design a single phase full bridge rectifier as shown below with Resistive load if one diode is opened and plot the waveform of output voltage and current.
3. Design a Single phase full bridge rectifier using with and without C –Filter with RLE load and plot the waveform of output voltage and current using MATLAB/Simulink.
4. Develop a simulink model of a Single phase half wave phase controlled Converter with RL load and plot current and voltage waveform using MATLAB/Simulink.
5. Develop a simulink model of a Single phase half wave phase controlled Converter with RL load and plot current and voltage waveform using MATLAB/Simulink.
6. Develop a simulation model of a single phase semi controlled converter feeding RL load and show the waveforms of output voltage, output current, input current and voltage across any one thyristor and diode for a firing angle of 30^o
7. Draw the simulink model of a Single phase full wave phase Inverter with R load using pulse generator
8. Draw the simulink model of a Single phase full wave phase Inverter with R load with Bipolar switching scheme.
9. Draw the simulink model of a Single phase full wave phase Inverter with R load with Bipolar switching scheme.
10. Develop a simulation model for the Simulation of a three phase bridge VSI using 150o conduction mode and compare it with 120o and 180o mode of conduction.

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MISL-921(O)/580201(New)
ADVANCED POWER ELECTRONICS

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To learn standard terms and definitions, to understand the need for soft switching converter and various isolated and non isolated converter protective their characteristics, operating principle.
- To understand the concept of Voltage and current source converter and various modulation technique for switching inverters.

Unit I
Power Supplies: – An introduction toLinear Power Supplies, Overview of Switch-Mode DC Power Supply (SMPS), Power Conditioners and UPS. PWM techniques for converters. Electric Utility Applications of power electronics.

Unit II
Non-Isolated Switch Mode DC-DC Converter: – DC-DC converters such as BUCK, BOOST, BUCK-BOOST, Cuk, SEPIC etc. Steady-state and time-domain analysis, CCM & DCM mode of operation, Feedback control schemes for dc-dc converters such as voltage-mode control and current mode control.

Unit III
Isolated Switch Mode DC-DC Converter: – Classification of isolated dc-dc converters, need of isolation, Buck and Boost derived isolated converters: basic concept and analysis.

Unit IV
Resonant Converters: – Concept of soft-switching, Zero-Voltage (ZVS) and Zero-Current Switching (ZCS), Classification of soft switching resonant converters. Introduction to Zero-voltage transition (ZVT) and zero current transition (ZCT) converters.

Unit V
Switching Mode Inverters: – Basic concept of 1-Φ, 3-Φ Switching Inverters, Inverter configurations Voltage-Source Inverter, Current-Source Inverter etc., Unipolar and Bipolar Switching, PWM modulation techniques for Switching Inverters.

Reference & Text Books:

1. Fundamentals of Power Electronics: Robert Erickson
2. Power Electronics: A first course by Ned Mohan, John Wiley & Sons, Inc.
3. Power Electronic Circuits: Issa Batarseh, John Wiley & Sons, Inc.
1. Power Electronics Handbook: M.H. Rashid, Prentice Hall
4. Switching Power Supply design: Abraham I Pressman
5. Power Electronics : Converters, Applications & Design – N. Mohan, John Wiley & Sons, Inc.

Course Outcomes:
After completing this course the students will be able to:

CO1 Know various terms, ratings and definitions associated related to power supply, Non Isolated DC-DC Converter, Resonant converter, Switch mode inverter.
CO2 Classify SMPS, DC-DC converter, isolated dc-dc converter, Resonant converter based on various criterion.
CO3 Identify and select SMPS, DC-DC converter, non isolated dc-dc converter, resonant converters and switching mode inverters for specific applications.
CO4 Understand the concept of PWM technique for converter, soft-switching and hard switching in DC-DC converter.
CO5 Develop an ability and skill to design the various types of SMPS, isolated and non isolated dc-dc converter, resonant converters, and switching mode inverters.
CO6 Apply the various principles of PWM switching techniques in isolated, non isolated DC-DC converter and switching mode inverters.

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Electrical Engineering Department

MISL-922 (O)/580201(New)
COMPUTER AIDED PROTECTION

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To introduce students to power system protection and switchgear.
- To teach students theory and applications of the main components used in power system protection for electric machines, transformers, bus bars, overhead and underground feeders.
- To teach students the theory, construction, applications of main types Circuit breakers, Relays for protection of generators, transformers and protection of feeders from over- voltages and other hazards.
- To develop an ability and skill to design the feasible protection systems needed for each main part of a power system in students.

Unit I

Microprocessors Based Protective Relays, Over current, Impedance, Directional, reactance, MHO, off set MHO relays, interface for distance relays, based on - line protection of Generator and Transformer.

Unit II

Digital Protection, Static relays using digital techniques, Digital relaying algorithm, on- line digital protection of three phase EHV/UHV transmission system. Digital protection of Generator, Transformer, Digital protection for parallel transmission line.

Unit III

Recent Developments, Fuzzy set approach to fault type and its location, Neutral Network application to fault location, High Impedance fault detection techniques. Introduction to genetic algorithm.

Unit IV

Review of Electromagnetic Relay, Design, aspect of relay, coordination of relay setting , performance of relay i. e. speed , reliability & transient performance, testing of D / C & distance relays.

Unit V

Static Relays. Protection, Comparators, amplitude and phase Comparators, phase splitting techniques, Vector product devices, multi input Comparators. Block diagram representation of static instantaneous, over current, inverse DTL, IDMTL O/C relays. Static protection schemes for line, Transformer and generator.

Reference & Text Books:

1. Switchgear and Protection by Rabindranath and M Chander
2. Switchgear and Protection by Sunil S Rao Khanna Publishers , New Delhi
3. Digital Protection by L.P.Singh, Wiley Eastern Ltd.
4. Power System Protection & Switchgear by Badri Ram & D.N. Vishwakarma, TMH Publishing Company Ltd. New Delhi.
5. Switchgear and Protection by M.V. Deshpande, TMH Publishing Company Ltd. New Delhi.

Course Outcomes:

After completing this course the students will be able to:

CO1	Gains knowledge on different Protective Equipments or Power Systems
CO2	Know about various protective systems- how it works and where it works?
CO3	Different applications of the relays, circuit breakers, grounding for different elements of power system are also discussed in the subject.
CO4	Discuss recovery and Restriking.
CO5	Express Oil circuit Breaker, Air Blast circuit Breakers, SF6 Circuit Breaker.
CO6	Identify DMT,IDMT type relays
CO7	Identify Rotor, Stator Faults, interterm faults and their protection.

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Electrical Engineering Department

MISL/MMCL-923(O)/590203

MODELING, SIMULATION AND EVOLUTIONARY TECHNIQUES

L	T	P	Total Credits	Theory End Sem	Mid Sem	Quiz/Assignment
03	01	-	04	70	20	10

Course Objectives:

- To familiarize with soft computing concepts.
- To introduce the ideas of neural networks, fuzzy logic and use of heuristics based on human experience.
- To introduce the concepts of Evolutionary computing based Technique and its applications.
- To provide the thorough knowledge of formulating an optimization problem, classification of optimization techniques, different solution strategies, and performance criterion
- This course also provides necessary mathematical background for understanding and implementing soft computing Techniques, such as neural networks, fuzzy systems, and genetic algorithms

Unit-I Model classification, Mathematical, physical and analog models,Computer simulation of continuous and discrete systems. Introduction to soft computing, Human brain and Biological Neurons, Model of an artificial neuron, Comparison between artificial and biological neural network, Characteristics of Artificial Neural Network (ANN), Basic concepts of ANN, Classification of ANN, Perceptron model and linear separability, Multilayer perceptron model, backpropagation learning, supervised, unsupervised and competitive learning, Architecture and training algorithm of Hopfield network, Radial basis function network, Kohonen self organizing feature map, counterpropagation network

Unit-II Introduction to fuzzy sets and operations, fuzzy relations, measure of fuzziness, fuzziness and probability theory, membership function and their features, fuzzification, defuzzification, fuzzy inference system (FIS), fuzzy inference methods, Mamdani and Takagi-Sugeno fuzzy methods, Fuzzy controller, Hybrid fuzzy neural systems.

Unit-III. Evolutionary versus traditional optimization methods, Classification of optimization problems, Genetic algorithm concepts and working principle, differences between GAs and traditional methods, similarities between GAs and traditional methods, fitness function, reproduction, crossover and mutation operators in binary coded and real coded GAs, concept of schema, constraint handling in GAs.

Unit-IV Introduction to Swarm Intelligence, Particle Swarm Optimization, Differential evolution, Ant Colony Optimization, bacterial foraging algorithm, Harmony search algorithm, and artificial bee colony optimization. Algorithm and population update mechanism of the above nature inspired evolutionary optimization techniques. Statistical analysis of results, Determination of mean and standard deviation of population, Introduction to hybrid evolutionary techniques

Unit-V Introduction toMATLAB and Its tool boxes (like Neural network, fuzzy logic, Genetic Algorithm, Optimization toolbox), MATLAB implementation ofneuralnetworks, fuzzy logic, Genetic algorithm, Particle Swarm Optimization, Differential evolution etc. with examples

Text and Reference Books:

1. P.D. Wasserman: Neural Computing Theory and Practice, Van Nostrand Reinhold Co. New York, NY, USA ©1989
2. B. Yegnanarayana: Artificial Neural Networks, PHI private limited, 2006
3. Fu Limin: Neural Networks in Computer Intelligence, McGraW-Hill Inc., 1994
4. S.N. Sivanandam, S. Sumathi and S.N. Deepa: Introduction to Neural Networks using Matlab 6.0, Tata McGraw-Hill Education Pvt. Ltd., 2012
5. S. Rajasekaran and G.A. Vijayalakshmi Pai: Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI Learning Pvt. Ltd., 2003
6. N.P. Padhy: Artificial Intelligence and Intelligent Systems, Oxford University Press, 2005

7. S.N. Sivanandam, S. Sumathi and S.N. Deepa: Introduction to Fuzzy Logic using Matlab, Springer Science & Business Media, 2006
8. K. Deb: Optimization for Engineering Design: Algorithms and Examples, Prentice-Hall of India, 2004
9. K. Deb: Multiobjective Optimization using Evolutionary Algorithms, John Wiley & Sons, 2001
10. Principles of Soft Computing by S.N Sivanandanam and S. N.Deepa, Wiley, 2011
11. Fuzzy Sets & Fuzzy logic (Theory & Applications) By G.J.Klir and Boyuan, PHI-2001

Course Outcomes:

After completing this course the students will be able to:

CO1 Describe the optimization problem, paradigms of soft computing, neural network models, fuzzy logic operators and MATLAB toolboxes

CO2 Classify optimization algorithms and the fuzzy and evolutionary modeling methods mentioned above

CO3 Investigate the operations and algorithms used for solving classical and practical optimization problems.

CO4 Apply the neural, fuzzy and evolutionary techniques for solving simple/complex and constrained/unconstrained optimization problems

CO5 Implement neural network, fuzzy logic, genetic algorithm and traditional algorithms using MATLAB toolboxes

CO6 Select the most appropriate model for solving real-world optimization problems

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Electrical Engineering Department

MISL-924(O)/580204(New)
ELECTRICAL MACHINE MODELING AND DRIVES

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To provide knowledge about the fundamentals of magnetic circuits, energy, force and torque of multi-excited systems.
- To analyze the steady state and dynamic state operation of DC machine through mathematical modeling and simulation in digital computer.
- To provide the knowledge of theory of transformation of three phase variables to two phase variables.
- To analyze the steady state and dynamic state operation of three-phase induction machines using transformation theory based mathematical modeling and digital computer simulation.
- To analyze the steady state and dynamic state operation of three-phase synchronous machines using transformation theory based mathematical modeling and digital computer simulation.

Unit-I Review of Electrical Drive: Dynamics of Electrical drive, Conventions and multi-quadrant operation, Transient and steady state stability of Electrical drive, Control of Electrical drive.

Unit-II Modeling of DC Machine: Theory of operation, Induced EMF, Equivalent circuit and Electromagnetic torque, electromechanical modeling, State-space model ling, Block diagram and Transfer functions. DC motor drives: DC motor and their performance, starting, braking, transient analysis, speed control, Ward-Leonard drives, controlled rectifier fed DC drives, control of fractional HP motors, Chopper controlled DC drives.

Unit-III Dynamic Modeling of Induction Machine: Real-Time model of a two-phase induction machine, Transformation to obtain constant matrices, Three-phase to two phase transformation, Generalized model in arbitrary reference frames, Derivation of commonly used induction motor models, Per unit model. Induction motor drives: Three-phase I.M. braking, transient operation, variable frequency control from voltage and current source.

Unit-IV Synchronous Machine : Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.

Unit-V Principle of operation of BLDCM ,Trapezoid ally excited BLDCM drive with current control,Permanent Magnet synchronous motor(PMSM) drive ,Stepper motor-Variable reluctance stepper motor ,PermanentMagnet stepper motor, Hybrid stepper motor, Introduction to vector control scheme and Switch Reluctance motor.

Reference & Text Books:

1. J.M.D. Murphy & F.G. Turnbull, “Power Electronic control of AC Motors”, Pergamon Press.
2. P.Lloyed & Conard, “Alternating Current Machines”, IEEE Press.
3. S.K.Pillai, “A First Course in Electrical Drives” , II Edition, New Age International (P) Ltd.
4. G.K.Dubey, “Fundamentals of Electrical Drives”, Narosa Publication (P) Ltd.
5. R.Krishnan, “Electric Motor Drives: Modeling, Analysis & Control”, Prentice-Hall.
6. B.K. Bose, “Modern Power Electronics & AC Drives”, Prentice- Hall.
7. V. Subrahmanyam,“Electrical Drives Concept & Application”, Tata McGraw Hill

Course Outcomes:

After completion of course student should able to:

CO1 Know the constructional behavior and understand the operation of AC and DC drives

CO2 Analyze the model and derive the transfer function of different drives

CO3 Understand the modeling, control & different modes of operation of AC and DC drives.

CO4 Understand and analyze the Power Electronics converters like Choppers, Rectifiers , Inverters fed AC & DC drives

CO5 Apply the concept of modeling to develop block diagram of AC and DC drives

CO6 Identify the need and choice for variable drives

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Electrical Engineering Department

MISL- 925(i) (o)/ 580205(New)
RESTRUCTURED POWER SYSTEMS

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- To provide detailed knowledge of the need and motivation behind Power System Restructuring, Restructuring process and various issues, Power system restructuring models, Role of Regulatory Commissions and Indian Electricity Acts.

Unit 1:
Introduction to electricity industry, Reforms of Electric power sector, Structure of Indian power sector, Indian Electricity Acts, Role of Regulatory Commissions in National and International Scenario, Role of ISO and other market players e.g. GenCos, DisCo, brokers and customers etc.

Unit 2:
Causes for earlier prevailing regulation in electric Power System, Motivation for Restructuring the electric power industry, restructuring process-unbundling and privatization, wholesale and retail competition, components and Power system restructuring models, trading arrangements (pool, bilateral and multilateral), forward and future contracts, Bidding Strategies.

Unit 3:
Power System Operation in competitive market, Operational Planning activities of ISO andGencos, functions and responsibilities of system operator, Unit commitment in deregulatedmarket environment, Load Flow Analysis and Optimal Power Flow under Restructured Power System scenario. Automatic generation control in restructured power market

Unit 4:
Congestion Management in restructured electricity market, Nodal electricity pricing, interzonal and intra-zonal congestion management, methods for managing congestion in emerging electric power market scenario. Available Transfer Capability (ATC), methods of determining ATC and enhancement of ATC in restructured electricity market, Role of FACTS devices in competitive power market

Unit 5:
Market power, types of market power, various indices used for analyzing market power inrestructured power market, Electricity pricing and challenges to electricity pricing, Transmission open access, transmission pricing/ wheeling charges in restructured electricitymarket, Congestion pricing.

Text and Reference Books:

1. Indian Electricity Bill 2003 with amendments
2. Central Regulatory Commission Act. 1998
3. Recommendations of NERC and FERC (Fundamental orders 888, 889 and 2000)
4. Power System Economics: Designing markets for electricity: by Steven Stoft, Wiley-IEEE Press, 2002
5. Power System Restructuring and Deregulation: Trading, Performance and Information Technology: by Loi Lei Lai, John Wiley & Sons Ltd, 2001
6. Power Systems Restructuring: Engineering and Economics by Marija Ilic, Springer Science & Business Media, 1998
7. Restructured Electrical Power Systems: Operation: Trading, and Volatility Mohammad Shahidehpour, M. Alomoush, CRC Press, Jun-2001

Course Outcomes:

After completing the course, the students will be able to-

CO1 **Describe the** Reforms of Electric power sector, Structure of Indian power sector, Indian Electricity Acts and Role of Regulatory Commissions, ISO and other market players.

CO2 **Explain** the Motivation for Restructuring, restructuring process, components and Power system restructuring models, Trading arrangements and Bidding Strategies.

CO3 **Describe** Power System Operation in competitive market, Operational Planning activities and responsibilities of system operator, Load Flow Analysis and Optimal Power Flow and Automatic generation control.

CO4 **Describe** Congestion Management, its types and methods for managing congestion, Nodal electricity pricing.

CO5 Explain Available Transfer Capability (ATC), methods of determining ATC and its enhancement, Role of FACTS devices in competitive power market.

CO6 **Describe** Market power, types of market power, Electricity pricing, challenges to electricity pricing and Congestion pricing.

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MISL- 925 (ii) (O)/ 580206(New)
DIGITAL SIGNAL PROCESSING

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

This course will introduce the basic concepts and techniques for processing signals on a computer. By the end of the course, you be familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors. The course emphasizes intuitive understanding and implementations of the theoretical concepts.

Unit-I Introduction to digital signals- Sampled data and digital signals, fourier transform and sampling theorem, data reconstruction by polynomial interpolation and extrapolation, zero and first order hold, linear point connector, Z and inverse Z transform , relation between Z, Laplace and Fourier transform, transfer function, stability, direct realization, cascade and parallel forms, frequency response.

Unit-II Analog Filters- Analog active filters-Butterworth, Chebyshev and other forms; low pass to band pass, high pass, band rejection transformation.

Unit-III Digital Filters- Recursive(IIR), non recursive(FIR) filters, Design of IIR filters by Bilinear transformation, Impulse and step variance methods, Design of FIR filters by Fourier series and window function methods, Effects of quantization and finite word length in digital filter Computer aided design of digital filters.

Unit-IV Discrete and Fast Fourier Transforms- Discrete Fourier transform and its functional properties, Fast Fourier transforms and algorithms.

Unit-V Signal Recovery, Detection and Prediction- Signal recovery in wideband and narrowband noise, Signal averaging, optimum signal estimation-Wiener and Kalman filter, Signal detection by Matched filter, detection error, signal prediction by Wiener predictor.

Reference & Text Books:

1. Digital Signal Processing Schaum's out lines by mowson H.Hays, Tata McGraw Hill Publishing Company Limited, New Delhi
2. Digital Signal Processing by S.P. Engene Xavier, S. Chand & Company Ltd. New Delhi.
3. Signal Processing & Linear Systems by B.P. Lathi, Oxford University Press.
4. Digital Signal Processing : Theory, Analysis & Digital filter Design by B.S. Nair, Prentice Hall of Indian Private Limited.
5. Digital Signal Processing by Stanley.
6. Introduction to D.S.P. by Johnny R. Johnson, Prentice Hall of Indian Private Limited.

Course Outcome

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

- CO1 Represent discrete-time signals analytically and visualize them in the time domain.
- CO2 Understand the meaning and implications of the properties of systems and signals.
- CO3 Understand the Transform domain and its significance and problems related to computational complexity

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MISL- 925 (iii) (o)/ 580207(New)
INDUSTRIAL ELECTRICAL SYSTEMS

L	T	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	04	70	20	10

Course Objectives:

- This course will introduce the basic concepts and techniques of various lighting scheme,
- Basic layout and design of Distribution Systems,
- Concept of power quality and
- Maintenance system that helps them diagnose and repair electrical faults

Industrial Utilization:Type of lighting scheme, Design of Lighting schemes, factory lighting, methods of lighting calculations, street lighting , flood lighting.

Design of Distribution Systems:Development of a distribution plan, primary distribution design, secondary distribution design, planning and design of town electrification scheme, design of industrial distribution systems.

Power Quality:Overview of Power quality, power quality & EMC standards, Overview of Reliability evaluation: Generation reliability, distribution reliability, Industrial Power Systems reliability.

Maintenance:An overview , role of maintenance in failure , design of maintenance system, need for maintenance planning , benefits of maintenance planning . Predictive maintenance, non destructive testing and diagnostic instruments, Safety management: Safety principle and guidelines, computers in maintenance and maintenance budget.

Introduction to ISO 9000 and TQM**:** History of Quality, Quality management, quality principles, total quality , total quality control, total quality management, ISO9000.

Reference & Text Books:

1. M.V. Deshpande, Electrical Power System Design, TMH, New Delhi
2. J.B. Gupta, Utilization of Electric Power & Electric Traction, Katson Publishing House
3. Math H.J. Bollen, Understanding Power Quality Problems, IEEE Press, Standard Publishers & Distrubutior, Dehli
4. P. Gopalkrishnan & A.K. Banergy, Maintenance and Spare Parts Management, PHI
5. Dr. K.C. Arora ,Total Quality Management, S.K. Katariay & Sons, New Delhi

Course Outcome

By the end of the course the student will be:

CO1 Familiar to various lighting scheme and their as per requirement

CO2 Able to understand layout and design of Distribution Systems

CO3 diagnose and repair electrical faults

MISP-926(O)/ 580208(New)

SYSTEMS & DRIVES LAB-II

1.To Control DC shunt motor using Semi-converter

(A) Speed variation and regulation of DC shunt motor inopen loop mode

(B) Demonstration of field failure protection.

(C) Demonstrations of soft start action.

(D) Speed variation and regulation of DC shunt motor in armature voltage control and feedback mode

2.To observe the performance of single phase full wave fully controlled converter with DC motor load

3. To observe the performance of dual converter using motor load.

4. To observe the performance of Multiquadrant operation of chopper fed DC motor drives.

5. Speed control of single phase Induction motor

(A) With PWM inverter based control

(B) AC regulator based control

6. To observe the performance of 3 phase rectifier

(A) To observe the performance of three phase half wave uncontrolled rectifier with R and RL-Load

(B) To observe the performance of three phase full wave uncontrolled rectifier with R and RL-Load

(C) To observe the performance of three phase full wave half controlled rectifier with R and RL-Load

(D) To observe the performance of three phase full wave half controlled rectifier with R, RL-Load and freewheeling Diode

7. To study of Vector control technique for three phase Induction motor drive.

8. Develop a simulink model brushless DC motor drives.

9. Develop a simulink model of Chopper control DC motor drives.

10. Develop a simulink model for Vector Controlled PMSM motor drives.

MISP-927(O)/580209 (New)
Computer Simulation Lab-II

1. Write a MATLAB code to plot the three phase AC waveform
2. Develop a MATLAB code to find the values of a given exponentially decaying sinusoidal function e^(-x/5)sin4x, and also, plot the corresponding curve.
3. Write a MATLAB code to determine the nature and value of roots of a given quadratic equation.
4. Write a MATLAB code to find the distance between the two points in Cartesian and polar coordinates using 'function'\
5. Write a MATLAB code to find the true, apparent and reactive power using 'function'
6. Write a MATLAB code plot different function on a single figure using subplot
7. Determine the response of RL & RC network when excited by DC source using MATLAB
8. Develop a MATLAB based program to determine the economical size of a conductor using modified Kelvin's law
9. Write a program in MATLAB to generate Bus Admittance Matrix (Ybus) of a given electrical network
10. Develop a MATLAB based code to determine the Bus Impedance Matrix (Zbus) of a given electrical network

MISL-931/ 580301 (New)
Semiconductor Controlled Drive

L	T	P	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	-	04	70	20	10

Course Objective: This course is an extension of power electronics application to advanced Electrical drives. It covers the detailed the advanced control of AC and DC drives that are used in industry

Unit 1:D.C. Drives, Single phase and three - phase fully-Controlled and half - Controlled rectifier fed Separately excited D.C. Motor. Chopper Controlled D.C. Drives, Closed - loop Control, Various Modes of operation and mode identification.

Unit 2: Mathematical modeling and performance evaluation of solid state drives under steady and transient Conditions for D.C. drives and I.M. Drives,

Unit 3: Control of I. M. by A. C. Voltage Controllers, I.M. Drives, and slip power Controlled I.M. Drives, Synchronous Motor variable speed Drives, Brush less D.C. and A.C. Motor drives,

Unit 4: Introduction to Microprocessor Controlled Drives, Principle of vector control, different vector control Schemes comparison of scalar and vector control of Induction motor.

Unit 5: Direct torque and flux control of three phase Induction motor. Solid-state device controllers for DC Traction motors, 3-phase induction motors used for starting, speed control and electric braking in Electric traction for main line and suburban services.

Reference Books:

1. J.M.D. Murphy & F.G. Turnbull, “Power Electronic control of AC Motors”, Pergamon Press.
2. P. Lloyed & Conard, “Alternating Current Machines”, IEEE Press.
3. S. K. Pillai, “A First Course in Electrical Drives” , II Edition, New Age International (P) Ltd.
4. G. K. Dubey, “Fundamentals of Electrical Drives”, Narosa Publication (P) Ltd.
5. R. Krishnan, “Electric Motor Drives: Modeling, Analysis & Control”, Prentice-Hall.
6. B.K. Bose, “Modern Power Electronics & AC Drives”, Prentice- Hall.
7. V. Subrahmanyam, “Electrical Drives Concept & Application” , Tata McGraw Hill

Course Outcomes:

After Completion of course student should be able to:

- CO1 Understand and analyze the Power Electronics converters like chopper, rectifiers etc, closed loop operation and different operating modes of DC drives.
- CO2 Understand the modeling and performance of different solid state AC and DC drives
- CO3 Know the basic operation and constructional behavior of AC, DC and Traction drive.
- CO4 Analyze the concept of modeling and closed loop control to derive the transfer function of DC and AC drives.
- CO5 Identify, formulate and solved engineering problems in drives.
- CO6 Identify the need and choice for variable drives.

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MISL-932 (i) / 580302 (New)
INDUSTRIAL INSTRUMENTATION

L	T	P	Total Credits	End Sem	Mid Sem	Quiz/Assignment
03	01	-	04	70	20	10

Review of different transducers, their characteristics, displacement, force, torque and speed measurement, measurement of different industrial processes, pressure measurement, flow measurement, temperature measurement.

Pressure Measurement: Different type of manometers, diaphragm gauges, bellow and force balance type sensors, bourdern gauge, piezoelectric, capacitive and inductive pressure pickups. Vacuum pressure measurements:Mcleod gauge, pirani gauge, thermocouple gauge, knudsen gauge, ionization calibration procedures.

Flow Measurement: Differential pressure flow meters, pitat tube, orifice, vanturi flow nozzle, hot wire flow meter, constant pressure drop, variable area meters (rotameter), turbine meters. Electromagnetic flow meters, ultrasonic flowmeters, measurement of level, differiential pressure method, conductive and capacitive method, electrochemical method, use of radioscope for level measurement.

Temperature Measurements: Different types of temperature transducers, RTDS, industrial type RTD sensor, laboratory grade platinum temperature thermometer, thermo resistance thermometer, thermisters temperature detectors, digital quartz crystal thermometer.

Displacement Measurement: Linear variable displacement transducer, capacitive transducer
Force measurement:Hydraulic force meter, pneumatic force meter, electric force transducers, strain gauge load cell, inductor load cells.

Torque Measurement:In-line rotating torque sensor, in-line stationary torque sensor, proximity torque sensors.
Speed Measurement: Variable reluctance speed transducer, d.c. techometer generator, a.c. techometer generator, revolution counter, resonance techometer, magnetic pick up sensors.

Measurement of Density: Measurement of density in solids, liquids and gases, Magnetic vibrational methods, Vibrating tube densitometer, vibrating cylinder densitometer, tuning fork and coriolis densitometer, hydrostatic weighing densitometer and balance type densitometer , hydrometers, radiation and refractometric densitometer.

Viscosity Measurement: Rotational viscometers, capillary viscometers, industrial viscosity meters.

Reference & Text Books:

1. Instrumentation Measurement and Analysis by B.C. Nakra & K.K. Chaudhary (VII Edition), Tata McGraw Hill Publishing Ltd., New Delhi.
2. Electrical Measurement and Measuring Instruments by A K sawhney (VII Edition), Dhanpat Rai & Co.
3. Industrial Instrumentation & Control, II edition by S.K. Singh, TMH, New Delhi
4. Industrial Control & Instrumentation by W. Bolton, Orient Longman Ltd. Hyderabad.
5. Principle of Industrial Instrumentation by D. Patranabis , TMH , New Delhi.
6. Measurement Systems & Applications by Doebelin (III Edition), McGraw Hill Book Co.

Course Outcomes:

After Completion of course student should be able to:

- CO1 Names and classify different types of transducers
- CO2 Describe constructional details & characteristics of different transducers
- CO3 Illustrate principle of operation of different transducers
- CO4 Figure out advantages and shortcomings of different transducers
- CO5 Recognize appropriate applications of transducers
- CO6 Explain and compute the various parameters of transducers

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MISL-932(ii) / 580303 (New)
FUZZY CONTROL

Introduction to knowledge based control, concepts of crispness, vagueness, uncertainty and fuzziness, crisp and fuzzy sets, and properties of fuzzy sets, operation on fuzzy sets, fuzzy relations, operation on fuzzy relations, approximate reasons, linguistic variables, fuzzy preposition, fuzzy if-then statements, interface rules, representation of set of rules, properties, completeness, consistency and continuity of a set of rules, structure of a fuzzy knowledge based controller (FKBC), the fuzzification module, knowledge base interface engine, de-fuzzification module rule base-variables, contents of rules, set of terms, derivation of rules, Database- choice of membership function and scaling factors, interface engine-composition based or individual rule based inference, inference with a set of rules. Choice of fuzzification procedure and defuzzification procedure, non-linear fuzzy control-PID like, sliding mode and sugeno- FKBCs. Adaptive fuzzy control, design and performance evaluation, various approaches to design, introduction to stability of fuzzy controllers.

Reference & Text Books:

1. An introduction to fuzzy control By Drainkov M.Reinjoank Naroasa publication (2^{nd} edition-97)
2. Fuzzy Switching & Automata, Theory & Applications. By kanadel A.& Lee S.C
3. Fuzzy Sets & Fuzzy logic (Theory & Applications) By G.J.Klir and Boyuan, PHI-2001

Course Outcomes:

After Completion of course student should be able to:

- CO1 Distinguish between the crisp set and fuzzy set concepts through the learned differences between the crisp set characteristic function and the fuzzy set membership function.
- CO2 Draw a parallelism between crisp set operations and fuzzy set operations through the use of characteristic and membership functions respectively.
- CO3 Define fuzzy sets using linguistic words and represent these sets by membership functions.
- CO4 Familiar with fuzzy relations and the properties of these relations.
- CO5 Thinking differently and have become capable, when necessary, to apply a new thinking methodology to real life problems including engineering ones.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Electrical Engineering Department

MISL 932(iii) / 580304 (New)

POWER SYSTEM INSTRUMENTATION AND CONTROL

Measurement of Electrical Quantities, Measurement of voltage, current, phase angle, frequency, active power and reactive power in power plants. Energy meters and multipart tariff meters.Voltage and Current Transformers Wound voltage transformers for measurement and protection, errors, transient performance; capacitive voltage transformers and their transient behavior; Current transformers for measurement and protection, composite errors, transient response. Hydro Electric Power Plant Instrumentation Measurement of flow, level, pressure, temperature, hydraulic head and mechanical vibration; Temperature scanners: Alarm annunciates.Thermal Power Plant Instrumentation Measurement of gas flow; Gas and feed-water analysis; Flame monitoring, Steam turbine instrumentation. Nuclear Power -Plant InstrumentationReactor safety, neutron flux measurement; Reactor power level and coolant measurements. Protective Relays Organization of protective relay; Single input, two -input and multi-input relays ; Electromagnetic, electronic and digital relays.

Reference & Text Books:

1. Modern Power Station Practice, Volume F; Control and Instrumentation, British Electricity International, Pregamon press, 1990.
2. Thomas C. Elliott, Standard Hand Book of Power Plant Engineering, McGraw-Hill 1989.
3. A.R. van C.Warrington, Protective Relays -Their Theory and Practice, Volume1, Chapman & Hall Ltd. London, 1968.
4. T.S.M. Rao, Power System Protection-Static Relays with Microprocessor Applications, Tata McGraw-Hill, 1992.

Course Outcomes:

After Completion of course student should be able to:

- CO1 Explain conventional & non conventional energy power plants.
- CO2 Describe modes of heat transfer.
- CO3 Discuss basics of distillation columns & gas absorptions.
- CO4 Distinguish between extraction, crystallization & drying.
- CO5 Identify methods of power generation.

MISL-932 (iv) / 580305 (New)
POWER SYSTEM ANALYSIS AND CONTROL

UNIT I: Energy Management Systems, Functions of energy control centre, Introduction to SCADA, Optimal unit commitment, Security constrained optimal unit commitment, Optimal generation scheduling. Security constrained economic dispatch. Solutions for optimal power flow.

Unit II: Power System components models, formation of bus admittance matrix, algorithm for formation of bus impedance matrix. Load flow analysis, Reactive power capability of an alternator, transmission line model & loadability, Regulated shunt compensation

UNIT III: Sensitivity analysis: Generation shift distribution factors, Line outage distribution factors, Compensated shift factors. Security assessment of energy system, Power systems security levels, security monitoring state estimation and contingency analysis, Pre-contingency corrective rescheduling.

UNIT-IV: Voltage control and reactive power control, Voltage stability: Proximity indicators e.g. slope of PV curve, Minimum Eigen value of reduced load flow Jacobian participation factors based on modal analysis and application. Reactive power transmission and associated difficulties, Models of OLTC & Phase shifting transformer.

UNIT-V: Brief description and definition of FACTs controllers, Thyristor controlled series compensator (TCSC), Transient stability model of TCSC. Static compensator (STATCOM), Operation of Static VAr compensator (SVC), Static synchronous series compensator (SSSC), Unified power flow controller (UPFC), power transmission control using Controllable series compensation (CSC), Configuration and operating characteristics of TCR, Use and implementation of Fixed Capacitor Thyristor Controlled Reactor (FC-TCR). Optimal placement of FACTS controller for voltage security enhancement.

Reference & Text Books:

1. Modern power system analysis D.P. Kothari, I.J. Nagrath, TMH, 2003
2. Power generation operation and control, A.J. Wood, B.F Woolenberg, John W
3.Understanding facts: Concepts and technologies of flexible AC transmissionsystem IEEE Press, 2001 N.G. Hingorani, L. Gyugyi
4. Power system stability and control IEEE press P. Kundur, 1994
5. Thyristor Based FACTS controllers for electrical Transmission systems- R.M.Mathur, R.K. Verma, Wieldy inter science, 2002

Course Outcomes:

After Completion of course student should be able to:

- CO1 Carry out load flow study of a practical system
- CO2 Simulate and analyze fault
- CO3 Study the stability of power systems

Industrial Training (580306)

Course Outcomes: Upon successful completion of the course the student will be able to

CO1	**Show** competence in identifying relevant information, defining and explained allotted topics
CO2	**Discuss** current real world issues related to Electrical Engineering
CO3	**Convey** intended meaning using verbal and non-verbal methods of communications
CO4	**Develop** social and professional ethics and leadership
CO5	**Explore** self-learning ability

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Electrical Engineering Department

Prelim Dissertation (580307)

Course Outcomes: Upon successful completion of the course the student will be able to

CO1	**Identify** the research problem after reviewing the Literature or field survey
CO2	**Formulate** research hypothesis
CO3	**Execute** experiments as per the target objectives
CO4	**Compose** observations and results by using appropriate statistical tools or software
CO5	**Develop** leadership and team work ability
CO6	**Communicate** effectively by means of oral, written and graphical presentation
CO7	**Appreciate** professional ethics

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Electrical Engineering Department

Dissertation Evaluation & Defense (580401)

Course Outcomes: Upon successful completion of the course the student will be able to

CO1	**Identify** the research problem after reviewing the Literature or field survey
CO2	**Formulate** research hypothesis
CO3	**Execute** experiments as per the target objectives
CO4	**Compose** observations and results by using appropriate statistical tools or software
CO5	Develop leadership and team work ability
CO6	**Communicate** effectively by means of oral, written and graphical presentation
CO7	**Appreciate** professional ethics