Sarvepalli Radhakrishnan University, Bhopal

SCHEME OF EXAMINATION AS PER AICTE MODEL CURRICULAM W.E.F JULY-2020

Department of Electrical Engineering (EE)

First Semester-Master of Technology

Specilazation in Power Electronics & Drives Marks & Credits Distribution of Subjects

	Subject Code	Core/ Elective	Name of Subject	Theory Slot			Practical		Total Marks	Credits Alloted Subject wise			Total Credits
				END sem	MID Sem Test (Two Test Avg.)	Quiz & Assignm-ents	END sem	Term Work		Lectures per week			
										L	T	P	
1	MTPE11	Core1	Electric Drives System	100	30	30			160	3	1	0	4
2	MTPE12	Core2	Modeling and Analysis of Electrical Machines	100	30	30			160	3	1	0	4
3	MTPE13	PE1	Elective-I	100	30	30			160	3	1	0	4
4	MTPE14	PE2	Elective-II	100	30	30			160	3	1	0	4
5	MTPE15	Core3	Research Methodology and IPR	100	30	30			160	3	1	0	4
6	MTPE16	Lab1	Electrical Drives Laboratory				50	50	100	0	0	4	2
7	MTPE17	Lab2	Electrical Machines Laboratory/Power Quality lab				50	50	100	0	0	4	2
8	MTPE18	Audit-I	Audit I							2			
TOTAL				500	150	150	100	100	1000	17	5	8	24
GRAND TOTAL : 1000						L : Lecture			T: Tutorial		P : Practical		

NOTE: Mid Semester Tests (MST) Taken at Least twice Per Semester

Elective-I	Elective-II
MTPE13 (A) Power Quality	MTPE14 (A) Static VAR Controllers and Harmonic Filtering
MTPE13 (B) Advanced Power Electronic Circuits	MTPE14 (B) PWM converter and Applications
MTPE13 (C) Dynamics of Electrical Machines	MTPE14 (C) Power Semiconductor Devices & Modeling

Audit I

MTPE18(A) English for Research Paper Writing, MTPE18(B) Disaster Management, MTPE18(C) Value Education

Sarvepalli Radhakrishnan University, Bhopal

SCHEME OF EXAMINATION AS PER AICTE MODEL CURRICULAM W.E.F JULY-2020

Department of Electrical Engineering (EE)

Second Semester-Master of Technology

Specilazation in Power Electronics & Drives Marks & Credits Distribution of Subjects

	Subject Code	Core/ Elective	Name of Subject	Theory Slot			Practical		Total Marks	Credits Alloted Subject wise			Total Credits
					MID Sem Test (Two Test Avg.)	Quiz & Assignm-ents		Term Work		Lectures per week			
										L	T	P	
1	MTPE21	Core3	Power Electronic Converters	100	30	30			160	4	1	0	5
2	MTPE22	Core4	Digital Control of Power Electronic and Drive Systems	100	30	30			160	4	1	0	5
3	MTPE23	PE3	Elective-III	100	30	30			160	4	1	0	5
4	MTPE24	PE4	Elective-IV	100	30	30			160	4	1	0	5
5	MTPE25	Core5	Minior Project with Seminar				100	60	160	-	0	4	2
6	MTPE26	Lab3	Power Electronics Laboratory				50	50	100	0	0	2	1
7	MTPE27	Lab4	Micro-controller Lab				50	50	100	0	0	2	1
8	MTPE28	Audit II	Audit II							2	0	0	0
TOTAL				400	120	120	200	160	1000	18	4	8	24

GRAND TOTAL : 1000		L : Lecture	T: Tutorial	P : Practical

NOTE: Mid Semester Tests (MST) Taken at Least twice Per Semester

Elective-III	Elective-IV
MTPE23 (A) Industrial Load Modeling and Control	MTPE24 (A) Smart Grids
MTPE23 (B) Switched Mode and Resonant Converters	MTPE24 (B)Advanced Microcontroller based Systems
MTPE23 (C) Advanced Digital Signal Processing	MTPE24 (C) Distributed Generation

Audit II
MTPE28(A) Constitution of India, MTPE28(B) Stress Management by Yoga, MTPE28(C) Pedagogy Studies

Sarvepalli Radhakrishnan University, Bhopal

SCHEME OF EXAMINATION AS PER AICTE MODEL CURRICULAM W.E.F JULY-2020

Department of Electrical Engineering (EE)

Third Semester-Master of Technology

Specilazation in Power Electronics & Drives

Marks & Credits Distribution of Subjects

	Subject Code	Core/ Elective	Name of Subject	Theory Slot			Practical Slot		Total Marks	Credits Alloted Subject wise			Credit	Total Credit
				END sem	MID Sem Test (Two Test Avg.)	Quiz & Assignm-ents	END sem	Term Work		Lectures per week				
										L	T	P		
1	MTPE31	PE5	Elective-V	100	30	30	0	0	160	4	1	0	5	5
2	MTPE32	OE	Open Elective-VI	100	30	30	0	0	160	4	1	0	5	5
3	MTPE33	Major	Phase-I Dissertation				400	280	680	0	0	20	10	10
TOTAL				200	60	60	400	280	1000	8	2	20	20	20

GRAND TOTAL : 1000 MARKS		L : Lecture	T: Tutorial	P : Practical

Elective-V	Open Elective-VI
MTPE31 (A) SCADA Systems and Applications	MTPE32 (A) Industrial Safety
MTPE 31(B) Facts and custom power devices	MTPE32 (B). Business Analytics, 2. Operations Research
MTPE31 (C) HVDC	MTPE32 (C) Cost Management of Engineering Projects

Sarvepalli Radhakrishnan University, Bhopal

SCHEME OF EXAMINATION AS PER AICTE MODEL CURRICULAM W.E.F JULY-2020

Department of Electrical Engineering (EE)

Fourth Semester-Master of Technology

Specilazation in Power Electronics & Drives

Marks & Credits Distribution of Subjects

	Subject Code	Core/ Elective	Name of Subject	Theory Slot			Practical Slot		Total Marks	Credits Alloted Subject wise Lectures per week			Credit	Total Credit
				END sem	MID Sem Test (Two Test Avg.)	Quiz & Assignm-ents	END sem	Term Work		L	T	P		
1	MTPE41	Major Project	Phase-II Dissertation				500	500	1000			30	15	15
TOTAL							500	500	1000			30	15	15
GRAND TOTAL : 1000 MARKS						L : Lecture			T: Tutorial		P : Practical			

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IST SEMESTER

CATEGORY:-CORE1

MTPE 11
ELECTRIC DRIVE SYSTEM

TOTAL-60HOURS

COURSE OBJECTIVE

1:To learn basics of electric drive analysis
2:To be able to analyze and design systems with electric drives
3:To learn to work in teams while working on engineering problems
4:To be able to write reports on the technical analysis performed
5:To learn to search the literature for more information on electric drives and report back on what was found in writing and orally

Unit-1
Dynamics of Electric Drives- Fundamentals of torque equation, Speed torque convention and ulti-quadrant operation, components of load torques.
(10HRS)

Unit- 2
Classification of load torques steady state stability, Load equation, Speed control and drive classification, Close loop control of drives.
(10HRS)

Unit- 3
DC motor Drives-Modeling of DC machines, Steady state characteristics with armature and speed control, Phase controlled DC motor drives, chopper controlled DC motor drives.
(10HRS)

Unit -4
Poly-phase induction machines- Dynamic modeling of induction machines, Small signal equations, control characteristics of induction machines, Phase-controlled induction machines.Stator voltage control, Slip energy recovery scheme, frequency control and vector control of induction motor drives.
(10HRS)

Unit-5
Traction motor- Starting.Speed-Time characteristics.Braking, Traction motors used in practice.
(10HRS)

Unit-6
Industrial Drives-Digital Control of Electric Drives, Stepper motor.Servo motor and their Applications.
(10HRS)

REFERENCE

1. G.K, Dubey, "Power semiconductor controlled Drives", Prentice Hall international, New Jersey, 1989.
2. R.Krishanam, “Electric motor drives modeling, analysis and control”, PHI-India-2009.
3. G. K. Dubey,“Fundamentals of electric Drives, Narosa Publishing House”, 2nd edition, 2011.
4. W. Leonhard, “Control of Electrical drives”, Springer, 3rd edition, 2001.
5. P.C. Krause –, “Analysis of Electric Machine”, Wiley-IEEE press 3rdedition.
6. K. Bose,“Modern Power Electronics and AC Drives”, Prentice Hall publication, 1st edition, 2001.

COURSE OUTCOME

This course will give the students a basic understanding of various methods of controlling electric machines for use in variable speed and positioning applications. The student will learn to analyze the steady state behavior of electric machine and drive systems.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-CORE2

MTPE 12

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1 : understanding the Construction Primitive 4 Winding Commutator Machine

2 : knowing the Construction, Working Principles Three Phase Induction Motor

3 : understanding the Construction, Working Principles, Performance behavior and Applications of DC Generator /DC Motor System.

4 : knowing the Construction, Working principles and Various Applications of Alternator /Synchronous Motor System .

Unit-1

Principles of Electromagnetic Energy Conversion, General expression of stored magnetic energy, Co-energy and force/torque, example using single and doubly excited system.
(10HRS)

Unit-2

Basic Concepts of Rotating Machines-Calculation of air gap mmf and per phase machine inductance using physical machine data; Voltage and torque equation of dc machine.
(10HRS)

Unit-3

Three phase symmetrical induction machine and salient pole synchronous machines in phase variable form, Application of reference frame theory to three phase symmetrical induction and synchronous machines, Dynamic direct and quadrature axis model in arbitrarily rotating reference frames
(10HRS)

Unit-4

Determination of Synchronous machine dynamic equivalent circuit parameters, Analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.
(10HRS)

Unit-5

Special Machines - Permanent magnet synchronous machine, Surface permanent magnet (square and sinusoidal back emf type) and interior permanent magnet machines, Construction and operating principle, Dynamic modelling and self-controlled operation.
(10HRS)

Unit-6

Analysis of Switch Reluctance Motors, Brushless D.C. Motor for space Applications, Recent trends.

(10HRS)

REFERENCE

1. Charles Kingsle,Jr., A.E. Fitzgerald, Stephen D.Umans, "Electric Machinery", Tata Mcgraw Hill
2. R. Krishnan, "Electric Motor & Drives: Modeling, Analysis and Control", Prentice Hall of India
3. Miller, T.J.E., "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press
4. P.C.Krause "Analysis of Electric Machine" Wiley IEEE Press 3rd Edition

COURSE OUTCOME

After completion of this course, students will be able to

1: describe the Performance Characteristics Primitive 4 Winding Commutator Machine

2: evaluate the Performance Three Phase Induction Motor

3: identify Applications of Three Phase Salient Pole Synchronous Machine .

4: explain the Various Applications of Various Applications of Alternator /Synchronous Motor System .

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IST SEMESTER

CATEGORY:-PE1

ELECTIVE I
MTPE 13 (A)
POWER QUALITY

TOTAL-60HOURS

COURSE OBJECTIVE

1:To understand the effect of nonlinear loads and disturbances on sensitive loads.
2:To know the standards and classification of power quality disturbances.
3:To Know the cause and effects of interruption.
4:To understand the concepts of causes and measurements of voltage sag.
5:To get knowledge on effect and mitigation of voltage sag.

Unit-1
Introduction-power quality-voltage quality-overview of power, Quality phenomena classification of power quality issues, Power quality measures and standards-THD-TIF-DIN-C-message weights, Flicker factor transient phenomena-occurrence of power quality problems, Power acceptability curves-IEEE guides, Standards and recommended practices.
(10HRS)

Unit-2
Harmonics-individual and total harmonic distortion, RMS value of a harmonic waveform, Triplex harmonics, Important harmonic introducing devices, SMPS, Three phase power converters-arcing devices saturable devices, Harmonic distortion of fluorescent lamps-effect of power system harmonics on power system equipment and loads.
(10HRS)

Unit-3
Modeling of networks and components under non-sinusoidal conditions, Transmission and distribution systems, Shunt capacitors-transformers, Electric machines, Ground systems loads that cause power quality problems, Power quality problems created by drives and its impact on drive.
(10HRS)

Unit-4
Power factor improvement- Passive Compensation, Passive Filtering, Harmonic Resonance, Impedance Scan Analysis, Active Power Factor Corrected Single Phase Front End, Control Methods for Single Phase APFC, Three Phase APFC and Control Techniques, PFC based on Bilateral Single Phase and Three Phase Converter.
(10HRS)

Unit-5
Hamilton-Jacobi-Bellman equation - model reference adaptive systems (MRAS) - Design hypothesis.
(10HRS)

Unit-6

Introduction to design method based on the use of Liapunov function, Design and simulation of variable structure adaptive model following control.

(10HRS)

REFERENCE

1. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007
2. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000
3. J. Arrillaga, "Power System Quality Assessment", John wiley, 2000
4. J. Arrillaga, B.C. Smith, N.R. Watson & A. R.Wood ,"Power system Harmonic Analysis", Wiley, 1997

COURSE OUTCOME

After completion of this course, students will be able to

1: Implement compensating techniques for a given power quality problem.
2: Suggest protection techniques under different fault condition.
3: Develop control technique for compensating devices.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-PE1

ELECTIVE I
MTPE 13 (B)
ADVANCED POWER ELECTRONIC CIRCUITS

TOTAL-60HOURS

COURSE OBJECTIVE
This course will develop students‘ knowledge in/on
1: characteristics and applications of Boost type APFC and control
2 : performance of control-Buck, Boost, Buck-Boost SMPS .
3 : performance of Half and Full Bridge Converters.
4: Modelling and design of DC-DC Converters for various renewable energy conversion.

Unit-1
Boost type APFC and control.
(10HRS)

Unit-2
Three phase utility interphases and control-Buck, Boost, Buck-Boost SMPS
Topologies.
(10HRS)

Unit-3
Modes of operation –Push-Pull and Forward Converter Topologies - Voltage Mode Control, Half and Full Bridge Converters.
(10HRS)

Unit- 4
Flyback Converter, Introduction to Resonant Converters, Load Resonant Converter. Zero Voltage Switching Clamped Voltage Topologies.
(10HRS)

Unit-5
Resonant DC Link Inverters with Zero Voltage Switching, High Frequency Link Integral Half Cycle Converter.
(10HRS)

Unit-6
Modelling and design of DC-DC Converters for various renewable energy conversion, Few power electronic circuits used in practice for controlling electric drives.
(10HRS)

REFERENCE

1. Rashid “Power Electronics” Prentice Hall India 2007.
2. G.K.Dubey et.al “Thyristorised Power Controllers” Wiley Eastern Ltd., 2005, 06.
3. Dewan&Straughen “Power Semiconductor Circuits” John Wiley &Sons., 1975.
4. G.K. Dubey& C.R. Kasaravada “Power Electronics & Drives” Tata McGraw Hill., 1993
5. Cyril W Lander “Power Electronics” McGraw Hill., 2005.
6. B. K Bose “Modern Power Electronics and AC Drives” Pearson Education (Asia)., 2007
7. Abraham I Pressman “Switching Power Supply Design” McGraw Hill Publishing Company., 2001.

COURSE OUTCOMES

After complection of this course,students will be able to
1: characteristics and applications of Boost type APFC and control
2 : performance of control-Buck, Boost, Buck-Boost SMPS .
3 : performance of Half and Full Bridge Converters.
4: Modelling and design of DC-DC Converters for various renewable energy conversion.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-PE1

ELECTIVE I
MTPE 13 (C)
DYNAMICS OF ELECTRICAL MACHINES

TOTAL-60HOURS

COURSE OBJECTIVE

To impart knowledge on

1. The key principles in Analysis of electrical machines
2. The Generalized Representation and steady state analysis of Synchronous Machines
3. The generator and motor operation in steady state and transient conditions
4. The analysis of harmonics in Ac machines
5. Representation of special machines

Unit-1

Stability, Primitive 4 Winding Commutator Machine, Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine.
(10HRS)

Unit-2

Torque Equation. Analysis of Simple DC Machines using the Primitive Machine Equations, The Three Phase Induction Motor.Transformed Equations, Different Reference Frames for Induction Motor Analysis Transfer Function Formulation.
(10HRS)

Unit-3

Three Phase Salient Pole Synchronous Machine, Parks Transformation- Steady State Analysis.
(10HRS)

Unit-4

Large Signal Transient. Small Oscillation Equations in State Variable Form, Dynamical Analysis of Interconnected Machines.
(10HRS)

Unit-5

Large Signal Transient Analysis using Transformed Equations, DC Generator /DC Motor System.
(10HRS)

Unit-6

Alternator /Synchronous Motor System
(10HRS)

REFERENCE

1. D.P. Sengupta & J.B. Lynn," Electrical Machine Dynamics", The Macmillan Press Ltd. 1980

2. R Krishnan "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education., 2001
3. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company, 1987
4. I. Boldia & S.A. Nasar,,"Electrical Machine Dynamics", The Macmillan Press Ltd. 1992
5. C.V. Jones, "The Unified Theory of Electrical Machines", Butterworth, London. 1967

COURSE OUTCOME

Students will be able to describe

1. The Generalized Representation of machines and their analysis
2. The steady state analysis and transient analysis of various machines
3. The performance of special machines and their representation.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-PE2

ELECTIVE II
MTPER 14(A)
STATIC VAR CONTROLLER AND HARMONIC FILTERING
TOTAL-60HOURS

COURSE OBJECTIVE
This course will develop students‘ knowledge in/on
1: To learn the powernflow in transmission system concept.
2 : To learn the operations of application voltage source converter.
3 : To learn the objectives of shunt compensation.

Unit-1
Fundamentals of Load Compensation, Steady-State Reactive Power Control in Electric Transmission Systems, Reactive Power Compensation and, Dynamic Performance of Transmission Systems.
(10HRS)

Unit-2
Power Quality Issues: Sags, Swells, Unbalance, Flicker, Distortion, Current Harmonics.Sources of Harmonics in Distribution Systems and Ill Effects .
(10HRS)

Unit-3
Static Reactive Power Compensators and their control, Shunt Compensators, SVCs of Thyristor Switched and Thyristor Controlled types and their control, STATCOMs and their control, Series Compensators of thyristor Switched and Controlled Type and their Control, SSSC and its Control, Sub-Synchronous Resonance and damping, Use of STATCOMs and SSSCs for Transient and Dynamic Stability Improvement in Power System.
(10HRS)

Unit-4
Converters for Static Compensation, Single Phase and Three Phase Converters and Standard Modulation Strategies (Programmed Harmonic Elimination and SPWM), GTO Inverters. Multi-Pulse Converters and Interface Magnetics, Multi-Level Inverters of Diode Clamped Type and Flying Capacitor Type and suitable modulation strategies (includes SVM), Multi-level inverters of Cascade Type and their modulation, Current Control of Inverters.
(10HRS)

Unit-5
Passive Harmonic Filtering, Single Phase Shunt Current Injection Type Filter and its Control, Three Phase Three-wire Shunt Active Filtering and their control using p-q theory and d-q modeling, Three phase four wire shunt active filters, Hybrid Filtering using Shunt Active Filters, Dynamic Voltage Restorer and its control, Power Quality Conditioner
(10HRS)

Unit-6

Series Active Filtering in Harmonic Cancellation Mode, Series Active Filtering in Harmonic Isolation Mode.

(10HRS)

REFERENCE

1. Ned Mohan et.al, "Power Electronics",John Wiley and Sons,2006.
2. G. Massobrio, P. Antognet," Semiconductor Device Modeling with Spice", McGraw-Hill, Inc.,1988.
3. B. J. Baliga," Power Semiconductor Devices",Thomson, 2004.

COURSE OUTCOME

After completion of this course, students will be able to

1: Understand the role of impedance control ,phase angle control and voltage control in controlling real and reactive power in transmission systems.

2: Identify configuration of FACTS controller required for a given application.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-PE2

ELECTIVE II
MTPE 14 (B)
PWM CONVERTERS AND APPLICATION

TOTAL-60HOURS

COURSE OBJECTIVE
This course will develop students‘ knowledge in/on
1: To understand and analyze PWM techniques for converter.
2 :To learn the designing of DC-DC power conversion.
3 :To analyze the performance of controlled AC-DC converter.

Unit-1
AC/DC and DC/AC power conversion, Overview of applications of voltage source converters and current source converters.
(10HRS)

Unit-2
Pulse width modulation techniques for bridge converters, Bus clamping PWM.Space vector based PWM, Advanced PWM techniques.
(10HRS)

Unit-3
Practical devices in converter, Calculation of switching and conduction power losses.
(10HRS)

Unit-4
Practical devices in converter, Calculation of switching and conduction power losses.
(10HRS)

Unit-5
Estimation of current ripple and torque ripple in inverter fed drives, Line-side converters with power factor compensation.
(10HRS)

Unit-6
Active power filtering.Reactive power compensation, Harmonic current compensation, Selective harmonic elimination PWM technique for high power electric drives.
(10HRS)

REFERENCE
1. Mohan, Undeland and Robbins, “Power Electronics: Converters, Applications and Design”, John’s Wiley and Sons.
2. Erickson RW, “Fundamentals of Power Electronics”, Chapman and Hall.
3. Vithyathil. J, “Power Electronics: Principles and Applications”, McGraw Hill.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

COURSE OUTCOME

After completion of this course, students will be able to

1: Design the control circuit and the power circuit for a given power converter.

2: Dertermine the power circuit configuration needed to fulfill the required power conversion with applicable constrints.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-PE2

ELECTIVE II
MTPE 14 (C)
POWER SEMICONDUCTOR DEVICES AND MODELING
TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1:To understand the back ground process related to the numerical solution used.

2:To choose the numerical solver to be used for a given type of analysis.

3:To understand the reson for convergence problem occurring during simulation and to avoid them.

Unit-1

Energy auditing: Types and objectives, Audit instruments- ECO assessment and Economic methods specific energy analysis, Minimum energy paths-consumption models-Case study.
(10HRS)

Unit-2

Electric Motors-Energy efficient controls and starting Efficiency, Motor Efficiency and Load Analysis, Energy efficient /high efficient Motors-Case study, Load Matching and selection of motors, Variable speed drives, Pumps and Fans-Efficient Control strategies, Optimal selection and sizing, Optimal operation and Storage: Case study.
(10HRS)

Unit-3

Transformer Loading/Efficiency analysis, Feeder/cable loss evaluation: Case study.Reactive Power Management, Capacitor Sizing-Degree of compensation, Capacitor losses-Location-Placement Maintenance, Case study.
(10HRS)

Unit-4

Peak Demand controls- Methodologies, Types of Industrial loads-Optimal Load, Scheduling-case study. Lighting- Energy efficient light sources, Energy conservation in Lighting Schemes, Electronic ballast-Power quality issues, Uminaries: case study
(10HRS)

Unit-5

Cogeneration-types and Schemes, Optimal operation of cogeneration plants-case study, Electric loads of Air conditioning & Refrigeration, Energy conservation measures, Cool storage. Types-optimal operation case study.
(10HRS)

Unit-6

Electric water heating, Gysers, Solar Water Heaters, Power Consumption in Compressors, Energy conservation measures, Electrolytic Process. Computer Controls. Software-EMS.
(10HRS)

REFERENCE

1. Giovanni Petrecca,. "Industrial Energy Management: Principles and Applications", TheKluwer international series -207,1999
2. Anthony J. Pansini, Kenneth D. Smalling,. "Guide to Electric Load Management", Pennwell Pub;(1998)
3. Handbook on Energy Audit and Environment Management , Y P Abbi and Shashank Jain, TERI, 2006
4. Handbook of Energy Audits Albert Thumann, William J. Younger, Terry Niehus, 2009.

COURSE OUTCOME

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

1:Understand the background process related to the numerical solution used.

2:Choose the numerical solver to be used for a given type of the analysis.

3:Understand the reason for convergence problem occurring during simulation and to avoid them.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IST SEMESTER

CATEGORY:-CORE3

MTPE 15
RESEARCH METHODOLOGY AND IPR

TOTAL-60HOURS

COURSE OBJECTIVE

Essentially it is the procedure by which the researchers go about their work of describing, evaluating and predicting phenomenon. It aims to give the work plan of research. It provides training in choosing methods materials, scientific tools and techniques relevant to the solution of the problem.

Unit 1

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.
(10HRS)

Unit 2

Effective literature studies approaches, analysis Plagiarism, Research ethics.
(10HRS)

Unit 3

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.
(10HRS)

Unit 4

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development, International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
(10HRS)

Unit 5

Patent Rights: Scope of Patent Right, Licensing and transfer of technology, Patent information and databases, Geographical Indications.
(10HRS)

Unit 6

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.
(10HRS)

REFERENCE

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall , "Industrial Design", McGraw Hill, 1992.
6. Niebel , "Product Design", McGraw Hill, 1974.
7. Asimov , "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in new Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

COURSE OUTCOME

Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project. identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-LAB1

MTPE16
ELECTRICAL DRIVES LABORATORY

COURSE OBJECTIVE

1:To learn basics of electric drive analysis

2:To be able to analyze and design systems with electric drives

3:To learn to work in teams while working on engineering problems

4:To be able to write reports on the technical analysis performed

5:To learn to search the literature for more information on electric drives and report back on what was found in writing and orally.

List of experiments:

1. Study of Thyristor controlled D.C Drive.
2. Study of Chopper Fed DC Motor.
3. Study of A.C single phase motor speed control using TRIAC.
4. PWM inverter fed three phase induction motor control using PSPICE/MATLAB/PSIM software.
5. VSI/CSI fed induction motor drive analysis using MATLAB/PSPICE/PSIM software.
6. Study of V/f control operation of three phase induction motor.
7. Study of permanent magnet synchronous motor drive fed by PWM inverter using software.
8. Regenerative/ Dynamic breaking operatation for DC motor study using software.
9. Regenerative/ Dynamic breaking operatation for AC motor study using software.
10. PC/PLC based AC/DC motor control operation.

COURSE OUTCOME

This course will give the students a basic understanding of various methods of controlling electric machines for use in variable speed and positioning applications. The student will learn to analyze the steady state behavior of electric machine and drive systems.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-LAB2

MTPE 17
ELECTRICAL MACHINES LABORATORY / POWER QUALITY LAB

ELECTRICAL MACHINES LABORATORY

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1 : understanding the Construction Primitive 4 Winding Commutator Machine

2 : knowing the Construction, Working Principles Three Phase Induction Motor

3 : understanding the Construction, Working Principles, Performance behavior and Applications of DC Generator /DC Motor System.

4 : knowing the Construction, Working principles and Various Applications of Alternator /Synchronous Motor System .

List of experiments:

1. Load test on dc shunt motor to draw speed – torque and horse power – efficiency characteristics.
2. Field Test on dc series machines.
3. Speed control of dc shunt motor by armature and field control.
4. Swinburne's Test on dc motor.
5. Retardation test on dc shunt motor.
6. Regenerative test on dc shunt machines.
7. Load test on three phase induction motor.
8. No load and Blocked rotor test on three phase induction motor to draw (i) equivalent circuit and (ii) circle diagram. Determination of performance parameters at different load conditions from (i) and (ii).
9. Load test on induction generator.
10. Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.
11. Conduct suitable tests to draw the equivalent circuit of single phase induction motor and determine performance parameters.
12. Conduct an experiment to draw V and _ curves of synchronous motor at no load and load conditions.

COURSE OUTCOME

Students will be able to describe

1. The Generalized Representation of machines and their analysis
2. The steady state analysis and transient analysis of various machines
3. The performance of special machines and their representation

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IST SEMESTER

CATEGORY:-LAB2

POWER QUALITY LAB

COURSE OBJECTIVE

To understand the effect of nonlinear loads and disturbances on sensitive loads.
To know the standards and classification of power quality disturbances.
To Know the cause and effects of interruption.
To understand the concepts of causes and measurements of voltage sag.
To get knowledge on effect and mitigation of voltage sag.

List of Experiments

1. To study the effect of non linear loads on power quality.
2. To demonstrate the voltage and current distortions experimentally.
3. To reduce the current harmonics with filters.
4. To study the voltage sag due to starting of large induction motor.
5. To study the capacitor switching transients.
6. To study the effect of balanced non linear load on neutral current , in a three phase circuit
7. To study the effect of ground loop.
8. To study the effect of voltage flicker .
9. To calculate the distortion power factor.
10. Study the effect of harmonics on energy meter reading.
11. To study effect of voltage sag on electrical equipments.
12. To obtain the current harmonics drawn by power electronics interface using PSCAD software .

COURSE OUTCOME

After completion of this course, students will be able to

1: Implement compensating techniques for a given power quality problem.
2: Suggest protection techniques under different fault condition.
3: Develop control technique for compensating devices.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-AUDIT-I

AUDIT I
MTPE 18 (A)
ENGLISH FOR RESEARCH PAPER WRITING

TOTAL-60HOURS

COURSE OBJECTIVE

1:Research objectives describe concisely what the research is trying to achieve. They summarize the accomplishments a researcher wishes to achieve through the project and provides direction to the study.

2:Promote student academic language growth. Include the use of either receptive (listening and reading) and/or productive language skills (speaking and writing) Connect clearly with the lesson topic or lesson activities.

Unit-1

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

(10HRS)

Unit-2

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

(10HRS)

Unit-3

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

(10HRS)

Unt-4

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

(10HRS)

Unit-5

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

(10HRS)

Unit-6

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

(10HRS)

REFERENCE

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

COURSE OUTCOME

After completion of this course, the students' will be able to

1:Begin with an Action Verb. Begin with an action verb that denotes the level of learning expected.

2:Follow with a Statement. Statement – The statement should describe the knowledge and abilities to be demonstrated.

Writing Objectives

1:The skill or behavior to be performed. ...

2:The conditions under which the student will perform the skill/demonstrate knowledge.

3:The Criteria used to Measure Performance.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-AUDIT-I

AUDIT I
MTPE 18 (B)
DISASTER MANAGEMENT

TOTAL-60HOURS

COURSE OBJECTIVE

1:Reduce, or avoid, losses from hazards.
2: Assure prompt assistance to victims.
3 Achieve rapid and effective recovery.
4: Disaster management aims to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery

Unit-1

Introduction: Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types AndMagnitude.
(10HRS)

Unit-2

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.
(10HRS)

Unit-3

Disaster Prone Areas In India: Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics
(10HRS)

Unit-4

Disaster Preparedness And Management : Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.
(10HRS)

Unit-5

Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co- Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.
(10HRS)

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Unit-6

Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

(10HRS)

REFERENCE

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

COURSE OUTCOME

After completion of this course, the students' will be able to

1:Understanding foundations of hazards, disasters and associated natural/social phenomena. ... Humanitarian Assistance before and after disaster.

2:Technological innovations in Disaster Risk Reduction

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IST SEMESTER

CATEGORY:-AUDIT-I

AUDIT I
MTPE 18 (C)
VALUE EDUCATION

TOTAL-60HOURS

COURSE OBJECTIVE

Main objective of value education is to include the essential values depending upon the objectives, they may be individual, social and national values for example in India, Maharashtra State has adopted the following values to be inculcated among the student through education.

Unit-1

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgements
(15HRS)

Unit-2

Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Discipline Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature.
(15HRS)

Unit-3

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature.
(15HRS)

Unit-4

Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence ,Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively.
(15HRS)

REFERENCE

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

COURSE OUTCOME

Students will gain deeper understanding about the purpose of their life. Students will understand and start applying the essential steps to become good leaders. Students will emerge as responsible citizens with clear conviction to practice values and ethics in life.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IIND SEMESTER

CATEGORY:-CORE3

MTPE 21
POWER ELECTRONIC CONVERTERS

TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: characteristics and applications of basic power semiconductor switches

2 : performance of controlled rectifiers.

3 : performance of chopper, inverter operation

4: A.C voltage controllers & Cyclo converter operation and power electronic applications in industry

Unit-1

Analysis of power semiconductor switched circuits with R, L, RL, RC loads, D.C. motor load, Battery charging circuit.

(10HRS)

Unit-2

Single-Phase and Three-Phase AC to DC converters, Half controlled configurations-operating domains of three phase full converters and semi-converters, Reactive power considerations.

(10HRS)

Unit-3

Analysis and design of DC to DC converters, Control of DC-DC converters: Buck converters, Boost converters, Buck- Boost converters, Cuk converters.

(10HRS)

Unit-4

Single phase and three phase inverters, Voltage source and Current source inverters, Voltage control and harmonic minimization in inverters.

(10HRS)

Unit-5

AC to AC power conversion using voltage regulators, Choppers and cyclo-converters, Consideration of harmonics, introduction to Matrix converters.

(10HRS)

Unit-6

Design aspects of converters, Few practical applications.

(10HRS)

REFERENCE

1. Ned Mohan, Undeland and Robbin, “Power Electronics: converters, Application and design”,

John's Wiley and sons. Inc, Newyork.
2. M.H.Rashid, "Power Electronics", Prentice Hall of India 1994.

COURSE OUTCOME

After completion of this course, students will be able to

1: determine the power semiconductor switches characteristics and their applications & design of snubber circuit.

2 : evaluate the performance of rectifiers. & Solve Problems

3 : analyze & describe the operation of inverters and choppers & Solve Problems

4 : evaluate the performance of AC voltage controllers and Cycloconverters

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IIND SEMESTER

CATEGORY:-CORE4

MTPE 22
DIGITAL CONTROL OF POWER ELECTRONICS AND DRIVE SYSTEMS
TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: characteristics and applications of basic power semiconductor switches

2 : performance of controlled rectifiers.

3 : Modelling of SCR, TRIAC, IGBT and Power Transistors in simulation

4: A.C voltage controllers & converter operation and power electronic applications in industry

Unit-1

Review of numerical methods, Application of numerical methods to solve transients in D.C, Switched R, L, R-L, R-C and R-L-C circuits. Extension to AC circuits.
(10HRS)

Unit-2

Modelling of diode in simulation, Diode with R, R-L, R-C and R-L-C load with AC supply, Modelling of SCR, TRIAC, IGBT and Power Transistors in simulation, Application of numerical methods to R, L, C circuits with power electronic switches, Simulation of gate/base drive circuits, simulation of snubber circuits.
(10HRS)

Unit-3

State space modelling and simulation of linear systems. Introduction to electrical machine modelling: induction, DC, and synchronous machines, simulation of basic electric drives, stability aspects.
(10HRS)

Unit-4

Simulation of single phase and three phase uncontrolled and controlled (SCR) rectifiers, Converters with self-commutated devices- simulation of power factor correction schemes.
(10HRS)

Unit-5

Simulation of converter fed DC motor drives, Simulation of thyristor choppers with voltage, Current and load commutation schemes, Simulation of chopper fed DC motor.
(10HRS)

Unit-6

Simulation of single and three phase inverters with thyristors and selfcommutated devices, Space vector representation, Pulse-width modulation methods for voltage control, Waveform control, Simulation of inverter fed induction motor drives.

(10HRS)

REFERERNCE

1. Simulink Reference Manual, Math works, USA

COURSE OUTCOME

After completion of this course, students will be able to

1: determine the power semiconductor switches characteristics and their applications & design of snubber circuit.

2 : evaluate the performance of rectifiers. & Solve Problems.

3 : Simulation of gate/base drive circuits, simulation of snubber circuits.

4 : evaluate the performance of AC voltage controllers and converters.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIND SEMESTER

CATEGORY:-PE3

ELECTIVE III
MTPE 23 (A)
INDUSTRIAL LOAD MODELING AND CONTROL

TOTAL-60HOURS

COURSE OBJECTIVE

To impart basic knowledge to the students about current energy scenario, energy conservation, audit and management. To inculcate among the students systematic knowledge and skill about assessing the energy efficiency, energy auditing and energy management.

Unit-1

Electric Energy Scenario-Demand Side Management-Industrial Load Management, Load Curves-Load Shaping Objectives-Methodologies, Barriers; Classification of Industrial Loads- Continuous and Batch processes -Load Modeling.

(10HRS)

Unit-2

Electricity pricing – Dynamic and spot pricing –Models, Direct load control- Interruptible load control, Bottom up approach- scheduling- Formulation of loadmodels- Optimization and control algorithms - Case studies.

(10HRS)

Unit-3

Reactive power management in industries-controls-power quality impactsapplication of filters Energy saving in industries.

(10HRS)

Unit-4

Cooling and heating loads- load profiling- Modeling, Cool storage-Types- Control strategies, Optimal operation-Problem formulation- Case studies.

(10HRS)

Unit-5

Captive power units- Operating and control strategies- Power Pooling- Operation models, Energy banking-Industrial Cogeneration

(10HRS)

Unit-6

Selection of Schemes Optimal Operating Strategies, Peak load saving-Constraints-Problem formulation- Case study, Integrated Load management for Industries.

(10HRS)

REFERENCE

1. C.O. Bjork “Industrial Load Management - Theory, Practice and Simulations", Elsevier, the Netherlands,1989.
2. C.W. Gellings and S.N. Talukdar, “Load management concepts,” IEEE Press, New York, 1986, pp. 3-28.
3. Y. Manichaikul and F.C. Schweppe ," Physically based Industrial load", IEEE Trans. on PAS, April 1981.
4. H. G. Stoll, "Least cost Electricity Utility Planning”, Wiley Interscience Publication, USA, 1989.
5. I.J.Nagarath and D.P.Kothari, .Modern Power System Engineering., Tata McGraw Hill publishers, New Delhi, 1995.
6. IEEE Bronze Book- “Recommended Practice for Energy Conservation and cost effective planningin Industrial facilities”, IEEE Inc, USA.

COURSE OUTCOME

1. Students will be able to apply the knowledge of the subject to calculate the efficiency of various thermal utilities.
2. Students will be able to design suitable energy monitoring system to analyz and optimize the energy consumption in an organization.
3. Students will be able to improve the thermal efficieny by designing suitable systems for heat recovery and co-generation.
4. Students will be able to use the energy audit methods learnt to identify the areas deserving tighter control to save energy expenditure.
5. Students will be able to carry out the cost- benefit analysis of various investment alternatives for meeting the energy needs of the organization.

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BHOPAL

IIND SEMESTER

CATEGORY:-PE3

ELECTIVE III
MTPE 23 (B)
SWITCHED MODE AND RESONANT CONVERTERS

TOTAL-60HOURS

COURSE OBJECTIVE
This course will develop students‘ knowledge in/on
1: characteristics and applications of Boost type APFC and control
2 : performance of control-Buck, Boost, Buck-Boost SMPS .
3 : performance of Half and Full Bridge Converters.
4: Modelling and design of Voltage Mode Control of SMPS.

Unit-1
Buck, Boost, Buck-Boost SMPS Topologies, Basic Operation-Waveforms - modes of operation - switching stresses, Switching and conduction losses. Optimum switching frequency, Practical voltage, current and power limits - design relations, Voltage mode control principles, Push-Pull and Forward Converter Topologies - Basic Operation, Waveforms, Flux Imbalance Problem and Solutions
(10HRS)

Unit-2
Transformer Design. Output Filter Design. Switching Stresses and Losses, Forward Converter Magnetics. Voltage Mode Control, Half and Full Bridge Converters. Basic Operation and Waveforms, Magnetics, Output Filter, Flux Imbalance, Switching Stresses and Losses, Power Limits, Voltage Mode Control.
(10HRS)

Unit-3
Classification of Resonant Converters. Basic Resonant Circuit Concepts, Load Resonant Converter, Resonant Switch Converter, Zero. Voltage Switching Clamped Voltage Topologies, Resonant DC Link Inverters with Zero Voltage Switching, High Frequency Link Integral Half Cycle Converter, Fly back Converter- discontinuous mode operation, waveforms, control, Magnetics- Switching Stresses and Losses, Disadvantages – Continuous Mode Operation, waveforms, control, design relations.
(10HRS)

Unit-4
Voltage Mode Control of SMPS- Loop Gain and Stability Considerations, Error Amp– frequency Response and Transfer Function, Trans-conductance Current Mode Control of SMPS, Current Mode Control Advantages, Current Mode Vs Voltage Mode.
(10HRS)

Unit-5
Current Mode Deficiencies, Slope Compensation,. Study of a typical Current Mode PWM Control IC UC3842, Modeling of SMPS, Small Signal Approximation- General Second Order Linear Equivalent Circuits, Study of popular PWM Control ICs (SG 3525,TL 494,MC34060 etc.)

(10HRS)

Unit-6

DC Transformer, Voltage Mode SMPS Transfer Function, General Control Law Consideration, EMI Generation and Filtering in SMPS - Conducted and Radiated Emission Mechanisms in SMPS, Techniques to reduce Emissions, Control of Switching Loci, Shielding and Grounding, Power Circuit Layout for minimum EMI, EMI Filtering at Input and Output, Effect of EMI Filter on SMPS Control Dynamics. Introduction to Resonant Converters.

(10HRS)

REFERENCE

1. Abraham I Pressman, "Switching Power Supply Design,". McGraw Hill Publishing Company,2001.
2. Daniel M Mitchell,"DC-DC Switching Regulator Analysis," McGraw Hill Publishing Company-1988.
3. Ned Mohan et.al, "Power Electronics," John Wiley and Sons 2006.

COURSE OUTCOME

After completion of this course,students will be able to
1: characteristics and applications of Boost type APFC and control
2 : performance of control-Buck, Boost, Buck-Boost SMPS .
3 : performance of Half and Full Bridge Converters.
4: Modelling and design of Voltage Mode Control of SMPS .

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIND SEMESTER

CATEGORY:-PE3

ELECTIVE III
MTPE 23(C)
ADVANCED DIGITAL SIGNAL PROCESSING

TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: Continuous-time (CT) and discrete-time (DT) signals

2: Discrete fourier transform (DFT), computational complexity of DFT and efficient implementation of DFT using fast fourier transform (FFT)

3: Specifying characteristics of frequency selective filters, design of linear-phase FIR filters

4: Classical analog butterworth & chebyshev filters, converting analog filter into equivalent digital filter to design digital IIR filters

Unit-1

Discrete time signals, Linear shift invariant systems, Stability and causality, Sampling of continuous time signals, Discrete time Fourier transform- Discrete Fourier series- Discrete Fourier Transform, Z transform-Properties of different transforms.

(10HRS)

Unit-2

Linear convolution using DFT, Computation of DFT Design of IIR digital filters from analog filters, Impulse invariance method, Bilinear transformation method.

(10HRS)

Unit-3

FIR filter design using window functions, Comparison of IIR and FIR digital filters, Basic IIR and FIR filter realization structures, Signal flow graph representations Quantization process and errors, Coefficient quantisation effects in IIR and FIR filters.

(10HRS)

Unit-4

A/D conversion noise- Arithmetic round-off errors, Dynamic range scaling, Overflow oscillations and zeroInput limit cycles in IIR filters, Linear Signal Models.

(10HRS)

Unit-5

All pole, All zero and Pole-zero models, Power spectrum estimation- Spectral analysis of deterministic signals, Estimation of power spectrum of stationary random signals.

(10HRS)

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Unit-6

Optimum linear filters, Optimum signal estimation, Mean square error estimation, Optimum FIR and IIR Filters .

(10HRS)

REFERENCE

1. Sanjit K Mitra, "Digital Signal Processing: A computer-based approach ",TataMc Grow-Hill Edition 1998

2. Dimitris G .Manolakis, Vinay K. Ingle and Stephen M. Kogon, "Statistical and Adaptive Signal Processing", Mc Grow Hill international editions .-2000

COURSE OUTCOME

After completion of this course, students will be able to

1: explain Continuous-time (CT) and discrete-time (DT) signals

2: find the DFT of a DT sequence, perform circular convolution using DFT & IDFT and compute 2, 4 & 8point DFT of a sequence using radix-2 DIT & DIF algorithms

3: design a linear-phase FIR filter with a prescribed magnitude response using windowing & frequency- sampling methods

4: design an IIR Butterworth/Chebyshev digital filter meeting the required specifications by performing impulse invariance/bilinear transformation

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BHOPAL

IIND SEMESTER

CATEGORY:-PE4

ELECTIVE IV
MTPE 24 (A)
SMART GRIDS

TOTAL-60HOURS

COURSE OBJECTIVE

1:To learn the concept of smart grid-electricity network.
2:To know the dc distribution and smart grid.
3:To know the understand of energy system concepts.
4:To learn the efficient electric end use technology alternatives.

Unit-1

Introduction to Smart Grid, Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Concept of Robust &Self-Healing Grid, Present development & International policies in Smart Grid.
(10HRS)

Unit-2

Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Smart Substations, Substation Automation, Feeder Automation
(10HRS)

Unit-3

Geographic Information System (GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU).
(10HRS)

Unit-4

Concept of micro-grid, need & applications of micro-grid, Formation of micro-grid, Issues of interconnection, Protection & control of micro-grid, Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel-cells, micro-turbines, Captive power plants, Integration of renewable energy sources.
(10HRS)

Unit-5

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit
(10HRS)

Unit-6

Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighbourhood Area Network (NAN), Wide Area Network (WAN), Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Basics of CLOUD Computing & Cyber Security for Smart Grid, Broadband over Power line (BPL), IP based protocols.

(10HRS)

REFERENCE

1. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE,2011.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009.
3. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, "Smart Grid: Technology and Applications", Wiley 2012.
4. Stuart Borlas'e, "Smart Grid:Infrastructure, Technology and solutions "CRC Press.
5. A.G.Phadke , "Synchronized Phasor Measurement and their Applications",Springer.

COURSE OUTCOME

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

1:Understand the concept of smart grid electricity network.

2: Understand the dc distribution & smart grid.

3: Understand the energy system concept.

4: Understand the efficient electric end use technology alternatives.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIND SEMESTER

CATEGORY:-PE4

ELECTIVE IV
MTPE 24 (B)
ADVANCED MICRO-CONTROLLER BASED SYSTEMS
TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: Architecture of 8051 microprocessor.

2: Assembly language programming.

3: Memory segmentation concept.

4: Architecture of 8056 microcontroller and its interfacing

Unit-1

Basic Computer Organization, Accumulator based processes-Architecture-Memory, Organization-I/O Organization

(10HRS)

Unit-2

Micro-Controllers-Intel 8051, Intel 8056- Registers, Memories, I/O Ports, Serial Communication, Timers, Interrupts, Programming.

(10HRS)

Unit-3

Intel 8051 – Assembly language programming-Addressing-Operations- Stack & Subroutines, Interrupts-DMA.

(10HRS)

Unit-4

PIC 16F877- Architecture Programming, Interfacing Memory/ I/O Devices, Serial I/Oand data communication

(10HRS)

Unit-5

Digital Signal Processor (DSP) - Architecture – Programming, Introduction to FPGA

(10HRS)

Unit-6

Microcontroller development for motor control applications, Stepper motor control using micro controller.

(10HRS)

REFERENCE

1. John.F.Wakerly: “Microcomputer Architecture and Programming”, John Wiley and Sons 1981.

2. Ramesh S.Gaonker: "Microprocessor Architecture, Programming and Applications with the 8085", Penram International Publishing (India), 1994.
3. Raj Kamal: "The Concepts and Features of Microcontrollers", Wheeler Publishing, 2005.
4. Kenneth J. Ayala, "The 8051 microcontroller", Cengage Learning, 2004.
5. John Morton," The PIC microcontroller: your personal introductory course", Elsevier, 2005.
6. Dogan Ibrahim," Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F Series", Elsevier, 2008.
7. Microchip datasheets for PIC16F877.

COURSE OUTCOME

After completion of this course, the students' will be able to

1: Explain the architecture of 8085.

2: Write assembly language programs by using 8085 microprocessor.

3: Discuss the various addressing modes of 8086 microprocessor.

4: Explain the architecture of 8051 microcontroller and its interfacing

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIND SEMESTER

CATEGORY:-PE4

ELECTIVE IV
MTPE 24 (C)
DISTRIBUTED GENERATION

TOTAL-60HOURS

COURSE OBJECTIVE

The Distributed Generation (DG) technologies, which include both conventional and non-conventional type of energy sources for generating power, are gaining momentum and play major role in distribution system as an alternative distribution system planning option.

Unit-1

Need for Distributed generation, Renewable sources in distributed generation and current scenario in Distributed Generation.

(10HRS)

Unit-2

Planning of DGs, Sitting and sizing of DGs optimal placement of DG sources in distribution systems, Grid integration of DGs Different types of interfaces, Inverter based DGs and rotating machine based interfaces, Aggregation of multiple DG units.

(10HRS)

Unit-3

Technical impacts of DGs, Transmission systems Distribution Systems De-regulation Impact of DGs upon protective relaying, Impact of DGs upon transient and dynamic stability of existing distribution systems, Steady-state and Dynamic analysis.

(10HRS)

Unit-4

Economic and control aspects of DGs Market facts, Issues and challenges Limitations of DGs, Voltage control techniques, Reactive power control, Harmonics Power quality issues, Reliability of DG based systems.

(10HRS)

Unit-5

Introduction to micro-grids, Types of micro-grids: autonomous and non-autonomous grids Sizing of micro-grids, Modeling & analysis of Micro-grids with multiple DGs, Micro-grids with power electronic interfacing units.

(10HRS)

Unit-6

Transients in micro-grids, Protection of micro-grids, Case studies,Advanced topics.

(10HRS)

REFERENCE

1. H. Lee Willis, Walter G. Scott, "Distributed Power Generation – Planning and Evaluation", Marcel Decker Press.
2. M.GodoySimoes, Felix A.Farret, "Renewable Energy Systems – Design and Analysis with Induction Generators", CRC press.
3. Stuart Borlase. "Smart Grid: Infrastructure Technology Solutions" CRC Press.

COURSE OUTCOME

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

A large scale deployment of distributed generation may affect grid-wide functions such as frequency control and allocation of reserves. As a result, smart grid functions, virtual power plants and grid energy storage such as power to gas stations are added to the grid.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIND SEMESTER

CATEGORY:-LAB3

MTPE 26
POWER ELECTRONICS LABORATORY

COURSE OBJECTIVE

1:To critically compare various options available for the circuit requirements.
2:To recognizm possible modes of failure of a circuit troubleshoot and repair.

List of Experiments

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without freewheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductiveloads.
7. To study single phase cyclo-converter.
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor.
9. To study operation of IGBT/MOSFET chopper circuit.
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

COURSE OUTCOME

The student will be able to:
1:Design the control circuit and the power circuit .
2:Understand the critically compare various options available for the circuit requirements.
3: Recognizm possible modes of failure of a circuit troubleshoot and repair.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IIND SEMESTER

CATEGORY:-LAB4

MTPE 27
MICROCONTROLLER LAB

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: assembly language programming.

2: memory segmentation concept.

EXPERIMENTS ON ASSEMBLY PROGRAM

1. Write a program to multiplication and division using MUL and DIV instructions.
2. Write a program to transfer a block of data from internal memory to external memory.
3. Write a program to exchange two set of eight-byte data.
4. Write a program to find the sum of two numbers in decimal.
5. Write a program to convert decimal number to hexadecimal.
6. Write a program to add a number n, m number of times.
7. Write program to find the largest from a set of n numbers.
8. Write program for sorting the given set of numbers.

COURSE OUTCOME

After completion of this course, the students‘ will be able to

1:Understand the assembly language programming.

2: understand memory segmentation concept

EXPERIMENTS ON 8051 INTERFACING

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: architecture of 8085 microprocessor.

2: assembly language programming.

3: memory segmentation concept.

4: architecture of 8051 microcontroller and its interfacing

List of Experiments

1. Write an assembly language program for generating a triangular wave.
2. Write a program to find the largest from a set of ten numbers and display it usingLEDs.
3. Write a program to for displaying the decimal numbers in 7 Segment display.
4. Write a program to read the DIP switches for displaying the reading using 7 Segmentdisplay.
5. Write a program to rotate the given motor in clockwise direction.
6. Write a program to rotate the given motor in anticlockwise direction.
7. Write a program to generate a square wave.
8. Write a program to display a message in LCD display.

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COURSE OUTCOME

After completion of this course, the students‘ will be able to

1: Explain the architecture of 8085.

2: Write assembly language programs by using 8085 microprocessor.

3: Discuss the various addressing modes of 8086 microprocessor.

4: Explain the architecture of 8051 microcontroller and its interfacing

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIND SEMESTER

CATEGORY:-AUDIT-II

AUDIT II
MTPE 28 (A)
CONSTITUTION OF INDIA

TOTAL-60HOURS

COURSE OBJECTIVE

1:worship It assures equality of status and opportunity.
2:It aims at securing a fraternity based on dignity of the individual and It aims at securing the unity and integrity of the nation.
3:The word Sovereign_means that India is both internally as well as externally free and is not dependent upon any outside authority.
4:It mentions the date (November 26, 1949) on which the constitution was adopted.
5:It states its objectives to secure justice, liberty, equality to all citizens and promote fraternity to maintain unity and integrity of the nation.

Goals of the ConstitutionWe the People of the United States, in Order
(1)to form a more perfect Union,
(2)establish Justice,
(3)insure domestic Tranquility,
(4)provide for the common defense,
(5)promote the general Welfare,
(6)secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish

Unit-1
History of Making of the Indian Constitution**:** History Drafting Committee,(Composition & Working)
(10HRS)

Unit-2
Philosophy of the Indian Constitution: Preamble Salient Features
(10HRS)

Unit-3
Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.
(10HRS)

Unit-4
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.
(10HRS)

Unit-5

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

(10HRS)

Unit-6

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

(10HRS)

REFERENCE

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

COURSE OUTCOME

After completion of this course, the students' will be able to

1:Understand the emergence and evolution of Indian Constitution. Understand and analyse federalism in the Indian context.

2:Understand and analyse the three organs of the state in the contemporary scenario.

3:Understand and Evaluate the Indian Political scenario amidst the emerging challenges.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIND SEMESTER

CATEGORY:-AUDIT-II

AUDIT II
MTPE 28 (B)
STRESS MANAGEMENT BY YOGA

TOTAL-60HOURS

COURSE OBJECTIVE

This course is a contemporary approach to the age-old techniques of exercises, breathing, meditation, and diet to bring the body, mind, and spirit at ease. Through the use of Yoga techniques, the desire to learn how to manage our lives in a healthful, positive, practical, and affordable way can be fulfilled.

Unit-1

Definitions of Eight parts of yog. (Ashtanga)
(20HRS)

Unit-2

Yam and Niyam, Do`s and Don't's in life, (i) Ahinsa, satya, astheya, bramhacharya and aparigraha (ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan
(20HRS)

Unit-3

Asan and Pranayam, (i) Various yog poses and their benefits for mind & body, (ii)Regularization of breathing techniques and its effects-Types of pranayam.
(20HRS)

REFERENCE

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur.
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.

COURSE OUTCOME

After completion of this course, the students' will be able to

1:Yoga can have a positive effect on the parasympathetic nervous system and aid in lowering heartbeat and blood pressure.
2:This reduces the demand of the body for oxygen.
3:Effective use of this practice can also reduce the chances of stress culminating in anxiety and depression.

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BHOPAL

IIND SEMESTER

CATEGORY:-AUDIT-II

AUDIT II
MTPE 28 (C)
PEDAGOGY STUDIES

TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1Evaluate your own teaching style and integrate it with digital learning pedagogy.
2:Plan activities that promote higher order thinking skills.
3:Identify the unique challenges teaching online presents with regard to time management and working with students virtually.

Unit-1

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions**,** Overview of methodology and Searching.
(12HRS)

Unit-2

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.
(12HRS)

Unit-3

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?, Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers’ attitudes and beliefs and Pedagogic strategies.
(12HRS)

Unit-4

Professional development: alignment with classroom practices and followup support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes.
(12HRS)

Unit-5

Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.
(12HRS)

REFERENCE

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.

2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

COURSE OUTCOME

After completion of this course, the students' will be able to

1:Learning outcomes describe the measurable skills, abilities, knowledge or values that students should be able to demonstrate as a result of a completing a course.

2:They are student-centered rather than teacher-centered, in that they describe what the students will do, not what the instructor will teach.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIIRD SEMESTER

CATEGORY:-PE5

ELECTIVE V
MTPE 31(A)
SCADA SYSTEM AND APPLICATIONS

TOTAL-60HOURS

COURSE OBJECTIVE

There are many objectives of SCADA System.

1.Improved overall System efficiency (capital & energy)

2.Increased penetration energy sources including renewable energy sources.

3.Reduced Energy Requirements in both the Transmission and Generation

4.Increased Relativity of sequence to essential loads.

Unit-1

Introduction to SCADA: Data acquisition systems, Evolution of SCADA, Communication technologies.

(10HRS)

Unit-2

Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

(10HRS)

Unit-3

Industries SCADA System Components: Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems.

(10HRS)

Unit-4

SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture –IEC 61850.

(10HRS)

Unit-5

SCADA Communication: various industrial communication technologies -wired and wireless methods and fiber optics, open standard communication protocols.

(10HRS)

Unit-6

SCADA Applications: Utility applications- Transmission and Distribution sector- operations, monitoring, analysis and improvement. Industries - oil, gas and water, Case studies, Implementation, Simulation Exercises.

(10HRS)

REFERENCE

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of AmericaPublications, USA,2004.
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and RelatedSystems", Newnes Publications, Oxford, UK,2004.
3. William T. Shaw, "Cybersecurity for SCADA systems", PennWell Books, 2006.
4. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.
5. Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power",PennWell 1999.

COURSE OUTCOME

After completion of this course, students will be able to

1.Improved overall System efficiency (capital & energy) and increased penetration energy sources including renewable energy sources.Reduced Energy Requirements in both the Transmission and Generation

2.Increased Relativity of sequence to essential loads.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIIRD SEMESTER

CATEGORY:-PE5

ELECTIVE V
MTPE 31(B)
FACTS AND CUSTOM POWER DEVICES

TOTAL-60HOURS

COURSE OBJECTIVE

1:To impart the students with various flexible ac transmission system devices which are used for proper operation of existing AC system more flexible in normal and abnormal conditions.

2:To learn the behavior of various FACTS devices.

3:To learn the objective of shunt and series compensator.

4:To learn the power flow in transmission system concept.

Unit-1

Reactive power flow control in Power Systems – Control of dynamic power unbalances in Power System, Power flow control -Constraints of maximum transmission line loading – Benefits of FACTS Transmission line compensation, Uncompensated line -Shunt compensation - Series compensation –Phase angle control. Reactive power compensation, Shunt andSeries compensation principles – Reactive compensation at transmission and distribution level .

(10HRS)

Unit-2

Static versus passive VAR compensator, Static shunt compensators: SVC and STATCOM - Operation and control of TSC, TCR and STATCOM - Compensator control, Comparison between SVC and STATCOM.

(10HRS)

Unit-3

Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators – TCVR and TCPAR Operation and Control –Applications, Static series compensation – GCSC,TSSC, TCSC and Static synchronous series compensators and their Control.

(10HRS)

Unit-4

SSR and its damping Unified Power Flow Controller: Circuit Arrangement, Operation and control of UPF, Basic Principle of P and Q control- Independent real and reactivepower flow control-Applications.

(10HRS)

Unit-5

Introduction to interline power flow controller. Modeling and analysis of FACTS Controllers – Simulation of FACTS controllers Power quality problems in distribution systems, harmonics, Loads that create harmonics, modeling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering – shunt , series and hybrid and their control.

(10HRS)

Unit-6

Voltage swells, sags, flicker, unbalance and mitigation of these problems by power line conditioners- IEEE standards on power quality.

(10HRS)

REFERENCE

1. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New AgeInternationalPublishers, 2007.
2. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modelling and Control",Springer Verlag, Berlin, 2006.
3. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.
4. K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut, 2003.
5. G. T.Heydt, "Power Quality", McGraw-Hill Professional, 2007.
6. T. J. E. Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982

COURSE OUTCOME

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

1:To impart the students with various flexible ac transmission system devices which are used for proper operation of existing AC system more flexible in normal and abnormal conditions.

2:Understand the role of impedance control,phase angle control and voltage control in controlling real and reactive power in transmission system.

3:Identify configuration of FACTS controlle required for a given application

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BHOPAL

IIIRD SEMESTER

CATEGORY:-PE5

ELECTIVE V
MTPE 31(C)
HVDC

TOTAL-60HOURS

COURSE OBJECTIVE

1. To learn the importance of HVDC.
2. To analyze HVDC converters.
3. To understand the concept of Voltage gradients of conductors.
4. To determine the interference caused by Corona and to measure its magnitude

Unit-1

Development of HVDC Technology, DC versus AC Transmission,Selection of converter configuration.

(10HRS)

Unit-2

Rectifier and Inverter operation, Digital Simulation of converters, Control of HVDC converters and Systems.

(10HRS)

Unit-3

Individual phase control, Equidistant firing controls, Higher level controls, Characteristics and non-characteristics harmonics filter design, Fault development and protection.

(10HRS)

Unit-4

Interaction between AC-DC power systems, Over voltages on AC/DC side, multi-terminal HVDC systems, control of MTDC systems.

(10HRS)

Unit-5

Modelling of HVDC systems, per unit system, Representation for power flow solution, representation for stability studies.

(10HRS)

Unit-6

Introduction to relevant national and international standards, safe clearances for HV, Study regulations for HV tests, Digital techniques in HV measurements.

(10HRS)

REFERENCE

1. J. Arrillaga, “High Voltage Direct Transmission”, Peter Peregrinus Ltd. London, 1983.

2. K. R. Padiyar, “HVDC Power Transmission Systems”, Wiley Eastern Ltd., 1990.
3. E. W. Kimbark, “Direct Current Transmission”, Vol. I, Wiley Interscience, 1971.
4. Erich Uhlmann, “Power Transmission by Direct Current”, B.S. Publications, 2004.

COURSE OUTCOME

After completion of this course, students will be able to

1. Qualitative comparison of AC and DC transmission system with all aspects
2. Understand the need of EHV AC transmission and various issues related with it
3. Reactive power management, Stability of AC and DC systems
4. In depth converter analysis, faults, protections, harmonic considerations, grounding system.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIIRD SEMESTER

CATEGORY:-OE

OPEN ELECTIVE VI
MTPE 32 (A)
INDUSTRIAL SAFETY

TOTAL-60HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1. To provide comprehensive learning platform to students where they can enhance their employ ability skills and become job ready along with real corporate exposure.
2. To enhance students’ knowledge in one particular technology.
3. To Increase self-confidence of students and helps in finding their own proficiency
4. To cultivate student’s leadership ability and responsibility to perform or execute the given task.
5. To provide learners hands on practice within a real job situation.

Unit-1

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.
(12HRS)

Unit-2

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.
(12HRS)

Unit-3

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, (i) Screw down grease cup, (ii) Pressure grease gun, (iii) Splash lubrication, (iv) Gravity lubrication, (v) Wick feed lubrication (vi) Side feed lubrication, (vii) Ring lubrication, Definition, principle and factors affecting the corrosion, Types of corrosion, corrosion prevention methods.
(12HRS)

Unit-4

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment’s like, (i) Any one machine tool, (ii) Pump (iii) Air compressor, (iv) Internal combustion engine, (v) Boiler, (vi) Electrical motors, Types of faults in machine tools and their general causes.
(12HRS)

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Unit-5

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: (i) Machine tools, (ii) Pumps, (iii) Air compressors, (iv) Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance, Repair cycle concept and importance.
(12HRS)

REFERENCE

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

COURSE OUTCOME

After completion of this course, students will be able to

1. Become master in one's specialized technology
2. Become updated with all the latest changes in technological world.
3. Ability to communicate efficiently.
4. Knack to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.
5. Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIIRD SEMESTER

CATEGORY:-OE

OPEN ELECTIVE VI
MTPE 32 (B.1)
BUSINESS ANALYTICS

TOTAL-60HOURS

COURSE OBJECTIVE

The goal of business analytics is to determine which datasets are useful and how they can be leveraged to solve problems and increase efficiency, productivity, and revenue. A subset of business intelligence (BI), business analytics is generally implemented with the goal of identifying actionable data.

Unit-1

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics, Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

(10HRS)

Unit -2

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression, Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

(10HRS)

Unit -3

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes, Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive
Modelling, nonlinear Optimization.

(10HRS)

Unit -4

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models, Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

(10HRS)

Unit -5

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.
(10HRS)

Unit -6

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.
(10HRS)

REFERENCE

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

COURSE OUTCOME

The student will be able to

1:Identify and describe complex business problems in terms of analytical models.

2:Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.

3:Translate results of business analytic projects into effective courses of action.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IIIRD SEMESTER

CATEGORY:-OE

OPEN ELECTIVE VI
MTPE 32 (B.2)
OPERATIONS RESEARCH

TOTAL-60HOURS

COURSE OBJECTIVE

The central objective of operations research is optimization, i.e., "to do things best under the given circumstances." This general concept has great many applications, for instance, in agricultural planning, biotechnology, data analysis, distribution of goods and resources, emergency and rescue operations.

Unit -1

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models
(12HRS)

Unit -2

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming
(12HRS)

Unit -3

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT
(12HRS)

Unit -4

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.
(12HRS)

Unit -5

Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation
(12HRS)

REFERENCE

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

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COURSE OUTCOME

After completion of this course, students will be able to

1:formulate and solve problems as networks and graphs.

2:develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems.

3:solve the problems using special solution algorithms.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIIRD SEMESTER

CATEGORY:-OE

OPEN ELECTIVE VI
MTPE 32(C)
COST MANAGEMENT OF ENGINEERING PROJECTS
TOTAL-60HOURS

COURSE OBJECTIVE
Project cost management is the process of estimating, budgeting, and controlling **costs** throughout the project life cycle, with the objective of keeping expenditures within the approved budget.

Unit-1
Introduction and Overview of the Strategic Cost Management Process
(12HRS)

Unit-2
Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and pportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.
(12HRS)

Unit-3
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process
(12HRS)

Unit-4
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making Problems, Standard Costing and Variance Analysis, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing. Costing of service sector, Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis, Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets, Measurement of Divisional profitability pricing decisions including transfer pricing.
(12HRS)

Unit-5
Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.
(12HRS)

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REFERENCE

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

COURSE OUTCOME

By the end of this course you will be able to:

1: Create a requirements document .
2:Create a Project Scope Statement.
3: Identify ways to control the scope of the project**.**
4:Decompose the work and develop work packages.
5: Create a Work Breakdown Structure.
6: Develop a Critical Path Schedule.
7: Review types of cost estimates.