SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		Power System Analysis				
Subject Code		MEXPS20S101				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives-

Students will be able to:

1. Study various methods of load flow and their advantages and disadvantages.
2. Understand how to analyze various types of faults in power system.
3. Understand power system security concepts and study the methods to rank the contingencies.
4. Understand need of state estimation and study simple algorithms for state estimation.
5. Study voltage instability phenomenon.

Course outcomes:

Students will be able to:

CO1: Calculate voltage phasors at all buses, given the data using various methods of load flow.

CO2: Calculate fault currents in each phase.

CO3: Rank various contingencies according to their severity.

CO4: Estimate the bus voltage phasors given various quantities viz. power flow, voltages, taps, CB status etc.

CO5: Estimate closeness to voltage collapse and calculate PV curves using continuation power flow.

Unit	Syllabus	Periods
UNIT-I	Load flow Overview of Newton-Raphson, Gauss-Siedel fast decoupled methods, convergence properties, sparsely techniques, handling Q- max violations in constant matrix, inclusion in frequency effects.AVR in load flow, handling of discrete variable in load flow.	12
UNIT-II	Fault Analysis**:** Simultaneous faults, Open conductors faults, Generalized method of fault.	8
UNIT-III	Security Analysis: Security state diagram, contingency analysis, generator shift distribution factors line outage distribution factor, multiple line outages, overload index ranking.	11

UNIT-IV	Power System Equivalents: WARD REI. equivalents State Estimation : Sources of errors in measurement Virtual and Pseudo, Measurement, servability, Tracking state estimation.	**12**
UNIT-V	WSL method, bad data correction. Voltage Stability: Voltage collapse, P-V curve, multiple power flow solution, continuation power flow, optimal multiplies load flow, voltage collapse proximity indices.	**14**

Text Books:

1. J.J. Grainger &W.D.Stevenson, "Power system analysis ", McGraw Hill ,2003.

2. R. Bergen & Vijay Vittal , "Power System Analysis" ,Pearson , 2000.

Reference Books:

1. L.P. Singh , "Advanced Power System Analysis and Dynamics", New Age International, 2006.

2. G.L. Kusic, "Computer aided power system analysis", Prentice Hall India, 1986.

3. A.J. Wood, " Power generation, operation and control" , John Wiley, 1994.

4. P.M. Anderson, "Faulted power system analysis", IEEE Press, 1995.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		POWER SYSTEM DYNAMICS-I				
Subject Code		MEXPS20S102				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
Students will be able to:

1. Study of system dynamics and its physical interpretation.
2. Development of mathematical models for synchronous machine.
3. Modeling of induction motor.

Course Outcomes:
Students will be able to:

CO1: Understand the modeling of synchronous machine in details.
CO2: Carry out simulation studies of power system dynamics using MATLAB-SIMULINK, MI POWER.
CO3: Carry out stability analysis with and without power system stabilizer (PSS).
CO4: Understand the frequency model and modeling of induction motors.
CO5: Understand the load modeling in power system.

Unit	Syllabus	Periods
UNIT-I	Synchronous Machines: Per unit systems, Park's Transformation (modified), Flux-linkage equations.	10
UNIT-II	Voltage and current equations, Formulation of State-space equations, Equivalent circuit.	12
UNIT-III	Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines.	11
UNIT-IV	Small signal model: Introduction to frequency model. Modeling of Induction Motors Prime mover controllers.	11

UNIT-V	Excitation systems and Philips-Heffron model, PSS Load modeling.	**12**

Text Book(S) :

1. P. M. Anderson & A. A. Fouad "Power System Control and Stability", Galgotia , New Delhi, 1981.
2. J Machowski, J Bialek& J. R W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997.

Reference Books:

1. P.Kundur, "Power System Stability and Control", McGraw Hill Inc., 1994.
2. E.W. Kimbark, "Power system stability", Vol. I & III, John Wiley & Sons, New York 2002.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		RENEWABLE ENERGY SYSTEM				
Subject Code		MEXPS20S103				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
Students will be able to:
1. To learn various renewable energy sources.
2. To gain understanding of integrated operation of renewable energy sources.
3. To understand Power Electronics Interface with the Grid.

Course Outcomes:-

Students will be able to:
CO1: Knowledge about renewable energy.
CO2: Understand the working of distributed generation system in autonomous/grid connected modes.
CO3: Knowledge about Economics of Distributed Generation.
CO4: Know the Impact of Distributed Generation on Power System.
CO5: Understand about Transmission System Operation.

Unit	Syllabus	Periods
UNIT-I	Introduction, Distributed vs. Central Station Generation, Sources of Energy such as Micro-turbines Internal Combustion Engines.	8
UNIT-II	Introduction to Solar Energy, Wind Energy, Combined Heat and Power Hydro Energy, Tidal Energy, Wave Energy, Geothermal Energy, Biomass and Fuel Cells.	9
UNIT-III	Power Electronic Interface with the Grid, Economics of Distributed Generation, Case Studies.	11

UNIT-IV	Impact of Distributed Generation on the Power System, Power Quality Disturbances.	**13**
UNIT-V	Transmission System Operation, Protection of Distributed Generators.	**14**

Text Book(S):

1. Ranjan Rakesh, Kothari D.P, Singal K.C, "Renewable Energy Sources and Emerging Technologies", 2nd Ed. Prentice Hall of India , 2011.
2. Math H.Bollen, Fainan Hassan, "Integration of Distributed Generation in the Power System", July 2011.

Reference Books:

1. Wiley –IEEE Press Loi Lei Lai, Tze Fun Chan, "Distributed Generation: Induction and Permanent Magnet Generators", October 2007, Wiley-IEEE Press.
2. Roger A. Messenger, Jerry Ventre, "Photovoltaic System Engineering", 3rd Ed, 2010 5.James F.Manwell, Jon G.McGowan.
3. Anthony L Rogers, "Wind energy explained: Theory Design and Application", John Wiley and Sons 2nd Ed, 2010.

SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		SMART GRIDS				
Subject Code		MEXPS20S104				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

Students will be able to:

1. Understand concept of smart grid and its advantages over conventional grid
2. Know smart metering techniques
3. Learn wide area measurement techniques
4. Understanding the problems associated with integration of distributed generation & its solution through smart grid.

Course Outcomes:

Students will be able to:

CO1. Appreciate the difference between smart grid & conventional grid.
CO2. Apply smart metering concepts to industrial and commercial installations.
CO3. Formulate solutions in the areas of smart substations, distributed generation and wide area measurements.
CO4. Come up with smart grid solutions using modern communication technologies.

Unit	Syllabus	Periods
UNIT-I	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.	**8**
UNIT-II	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.	**9**
UNIT-III	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	**11**

	Measurement Unit(PMU).	
UNIT-IV	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.	**13**
UNIT-V	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, Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood 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.	**14**

Text Books:

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.

Reference Book:

1. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, "Smart Grid: Technology and Applications", Wiley 2012.
2. Stuart Borlase, "Smart Grid: Infrastructure, Technology and solutions "CRC Press A.G. Phadke, "Synchronized Phasor Measurement and their Applications", Springer.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		HIGH POWER CONVERTERS				
Subject Code		MEXPS20S105				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

Students will be able to:

1. Understand the requirements of high power rated converters.
2. Understand the different topologies involved for these converters.
3. Able to understand the design of protection circuits for these converters.

Course Outcomes:-

Students will be able to:

CO1. Learn the characteristics of PSDs such as SCRs, GTOs, IGBTs and use them in practical systems.

CO2. Understand working of multi-level VSIs, DC-DC switched mode converters, cyclo-converters and PWM techniques and the ability to use them properly.

CO3. Acquire knowledge of power conditioners and their applications.

CO4. Design power circuit and protection circuit of PSDs and converters.

Unit	Syllabus	Periods
UNIT-I	Power electronic systems, An overview of PSDs, multi-pulse diode rectifier, multi-pulse SCR rectifier.	8
UNIT-II	Phase shifting transformers, multilevel voltage source inverters: two level voltage source inverter, cascaded, H bridge multilevel inverter.	9
UNIT-III	Diode clamped multilevel inverters, flying capacitor multilevel inverter, Design aspects of converters, protection of devices and circuits.	11
UNIT-IV	PWM current source inverters, DC to DC switch mode converters.	13

UNIT-V	AC voltage controllers: Cyclo-converters, matrix converter, Power conditioners and UPS.	**14**

Text Book(s):

1. N. Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: Converter, Applications and Design",John Wiley and Sons, 1989.
2. M.H. Rashid, "Power Electronics", Prentice Hall of India, 1994.

Reference Book:

1. B. K .Bose, "Power Electronics and A.C. Drives", Prentice Hall, 1986.
2. Bin Wu, "High power converters and drives", IEEE press, Wiley Enter science.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		WIND AND SOLAR SYSTEMS				
Subject Code		MEXPS20S106				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
Students will be able to:
1. To get exposure to wind and solar systems.
2. To understand the factors involved in installation and commissioning of a Solar or Wind plant.
4. Learning the dynamics involved when interconnected with power system grid.

Course Outcomes:-

Students will be able to:
CO1. Appreciate the importance of energy growth of the power generation from the renewable energy sources and participate in solving these problems.
CO2. Demonstrate the knowledge of the physics of wind power and solar power generation and all associated issues so as to solve practical problems.
CO3. Demonstrate the knowledge of physics of solar power generation and the associated issues.
CO4. Identify, formulate and solve the problems of energy crises using wind and solar energy.
CO5. Demonstrate the knowledge of Solar thermal power generation, PV power generation.

Unit	Syllabus	Periods
UNIT-I	Historical development and current status, characteristics of wind power generation, network integration issues.	8
UNIT-II	Generators and power electronics for wind turbines, power quality standards for wind turbines, Technical regulations for interconnections of wind farm with power systems.	9
UNIT-III	Isolated wind systems, reactive power and voltage control, economic aspects.	11
UNIT-IV	Impacts on power system dynamics, power system interconnection.	13

UNIT-V	Introduction of solar systems, merits and demerits, concentrators, various applications. Solar thermal power generation, PV power generation, Energy Storage device. Designing the solar system for small installations.	**14**

Text Book(s):

1. Thomas Ackermann, Editor, "Wind power in Power Systems", John Willy and sons ltd.2005
2. Siegfried Heier, "Grid integration of wind energy conversion systems", John Willy and sons ltd., 2006.

Reference Book:

1. K. Sukhatme and S.P. Sukhatme, "Solar Energy". Tata MacGraw Hill, Second Edition, 1996.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		ELECTRIC POWER DISTRIBUTION SYSTEM				
Subject Code		MEXPS20S107				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
Students will be able to:
1. Learning about power distribution system
2. Learning of SCADA System
3. Understanding Distribution Automation

Course Outcomes :
Students will be able to:
CO1. Knowledge of power distribution system.
CO2. Study of Distribution automation and its application in practice.
CO3. To learn SCADA system.
CO4. Learn calculation of optimum number of switches.
CO5. Learn SCADA applied to distribution automation.

Unit	Syllabus	Periods
UNIT-I	Distribution of Power, Management, Power Loads, Load Forecasting Short-term & Long-term, Power System Loading, Technological Forecasting.	8
UNIT-II	Advantages of Distribution Management System (D.M.S.) Distribution Automation Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction.	9
UNIT-III	Interconnection of Distribution, Control & Communication Systems Remote Metering, Automatic Meter Reading and its implementation.	11
UNIT-IV	SCADA: Introduction, Block Diagram, SCADA Applied To Distribution Automation. Common Functions of SCADA, Advantages of Distribution Automation through SCADA.	13

UNIT-V	Calculation of Optimum Number of Switches, Capacitors, Optimum Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman's Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution & Monitoring.	**14**

Text Book(s):

1. Anthony J Panseni, "Electrical Distribution Engineering", CRC Press.
2. James Momoh, "Electric Power Distribution, automation, protection & control", CRC Press.

Reference Book:

1. A.S. Pabla, "Electric Power Distribution", Tata McGraw Hill Publishing Co. Ltd., Fourth Edition.
2. M.K. Khedkar, G.M. Dhole, "A Text Book of Electrical power Distribution Automation", University Science Press, New Delhi.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		MATHEMATICAL METHODS FOR POWER ENGINEERING				
Subject Code		MEXPS20S108				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
Students will be able to:
1. To understand the relevance of mathematical methods to solve engineering problems.
2. To understand how to apply these methods for a given engineering problem.

Course Outcomes:
Students will be able to:
CO1. Understand vector spaces, linear transformation, eigen values and eigenvectors of linear operators.
CO2. Learn about linear programming problems and understanding the simplex method for solving linear programming problems in various fields of science and technology.
CO3. Acquire knowledge about nonlinear programming and various techniques used for solving constrained and unconstrained nonlinear programming problems.
CO4. Understand the concept of random variables, functions of random variable and their probability distribution.
CO5. Understand stochastic processes and their classification.

Unit	Syllabus	Periods
UNIT-I	Vector spaces, Linear transformations Matrix representation of linear transformation.	8
UNIT-II	Eigen values and Eigen vectors of linear operator Independent Random Variables Marginal and Conditional distributions Elements of stochastic processes	9
UNIT-III	Linear Programming Problems Simplex Method Duality Non Linear Programming problems.	11
UNIT-IV	Unconstrained Problems Search methods Constrained Problems.	13

UNIT-V	Lagrange method Kuhn-Tucker conditions Random Variables Distributions.	**14**

Text Book(s):

1. Kenneth Hoffman and Ray Kunze, "Linear Algebra", 2nd Edition, PHI, 1992
2. Erwin Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, 2004
3. Irwin Miller and Marylees Miller, John E. Freund's "Mathematical Statistics", 6th Edn, PHI, 2002
4. J. Medhi, "Stochastic Processes", New Age International, New Delhi., 1994
5. A Papoulis, "Probability, Random Variables and Stochastic Processes", 3rd Edition, McGraw Hill, 2002

Reference Book:

1. John B Thomas, "An Introduction to Applied Probability and Random Processes", John Wiley, 2000.
2. Hillier F S and Liebermann G J, "Introduction to Operations Research", 7th Edition, McGraw Hill, 2001.
3. Simmons D M, "Non Linear Programming for Operations Research", PHI, 1975.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		PULSE WIDTH MODULATION FOR PE CONVERTERS				
Subject Code		MEXPS20S109				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
Students will be able to:
1. To understand Necessity and Importance of PWM techniques Implementation of PWM controllers.

Course Outcomes :-Students will be able to:

CO1. Appreciate importance of PWM techniques.

CO2. Implement PWM using different strategies.

CO3. Control CSI and VSI using PWM.

CO4. Compare performance of converter for different PWM techniques.

CO5. Learn about linear programming problems and understanding the simplex

Unit	Syllabus	Periods
UNIT-I	Introduction to PE converters.	8
UNIT-II	Modulation of one inverter phase leg Modulation of single phase VSI and 3 phase VSI.	9
UNIT-III	Zero space vector placement modulation strategies Losses Discontinuous modulation Modulation of CSI.	11
UNIT-IV	Continuing developments in modulation as random PWM, PWM for voltage unbalance.	13

UNIT-V	Effect of minimum pulse width and dead time.	**14**

Text Books:

1. D. Grahame Holmes, Thomas A. Lipo, “Pulse width modulation of Power Converter: Principles and Practice”, John Wiley & Sons, 03-Oct-2003
2. Bin Vew, “High Power Converter”, Wiley Publication

Reference Book:

1. Marian K. Kazimicrczuk, “Pulse width modulated dc-dc power converter”, Wiley Publication

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		ELECTRIC AND HYBRID VECHILES				
Subject Code		MEXPS20S110				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
Students will be able to:
1. To understand upcoming technology of hybrid system
2. To understand different aspects of drives application
3. Learning the electric Traction

Course Outcomes :-Students will be able to:

CO1. Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.

CO2. Acquire knowledge about hybrid drive-train topologies.

CO3. Learn electric drive in vehicles / traction.

CO4. Acquire knowledge about Fuel efficiency analysis.

CO5. Learn about supporting subsystems.

Unit	Syllabus	Periods
UNIT-I	History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles Impact of modern drive-trains on energy supplies Basics of vehicle performance, vehicle power source characterization Transmission characteristics Mathematical models to describe vehicle performance.	10
UNIT-II	Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies Power flow control in hybrid drive-train topologies Fuel efficiency analysis.	9
UNIT-III	Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies Power flow control in hybrid drive-train topologies Fuel efficiency analysis.	12

UNIT-IV	Introduction to electric components used in hybrid and electric vehicles Configuration and control of DC Motor drives Configuration and control of Introduction Motor drives configuration and control of Permanent Magnet Motor drives Configuration and control of Switch Reluctance Motor drives, drive system efficiency.	**14**
UNIT-V	Matching the electric machine and the internal combustion engine (ICE) Sizing the propulsion motor, sizing the power electronics Selecting the energy storage technology Communications, supporting subsystems, Introduction to energy management and their strategies used in hybrid and electric vehicle Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies.	**14**

Text Book:

1. Sira -Ramirez, R. Silva Ortigoza, “Control Design Techniques in Power Electronics Devices”, Springer.

Reference Book:

1. Siew-Chong Tan, Yuk-Ming Lai, Chi Kong Tse, “Sliding mode control of switching Power Converters”.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	2	-	-	2
Subject Name		Research Methodology And IPR				
Subject Code		MEXPS20S111				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:-

Students will be able to:

1. To understand upcoming problem formulation.
2. To understand today's world is controlled by Computer, Information Technology Learning the
3. Understand that IPR protection provides an incentive to inventors

Course Outcomes:

At the end of this course, students will be able to

CO1. Understand research problem formulation.
CO2. Analyze research related information Follow research ethics
CO3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CO4. Understand that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CO5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Unit	Syllabus	Periods
UNIT-I	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.	8
UNIT-II	Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper	9

	Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	
UNIT-III	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.	**11**
UNIT-IV	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	**13**
UNIT-V	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.	**14**

Text Books:

1. Mayall , “Industrial Design”, McGraw Hill, 1992.
2. Niebel , “Product Design”, McGraw Hill, 1974.
3. Asimov , “Introduction to Design”, Prentice Hall, 1962.
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
5. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

Reference Books

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.

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SYLLABUS

CONTROL SYSTEM

Class		M.TECH	L	T	P	C
Semester/Year		I/I	2	-	-	-
Subject Name		English for Research Paper Writing				
Subject Code		MEXPS20S112				
Paper	English					
	Hindi					
Max. Marks		-				

	Course Objectives: **1.** The aim of the course is to improve competence in scholarly communications by deepening knowledge of the core features of the scientific writing style. **2.** In particular, they will develop an awareness of fundamental concepts of academic writing, such as contrastive rhetoric, logical organization, and argumentation.	
	Course Outcomes: Upon completion of the course, the students will be able to: **CO1:** Understand Planning and Preparation. **CO2:** Understand about Paraphrasing and Plagiarism, Sections of a Paper. **CO3:** Understand that which type of key skills needed when writing different type of headings. **CO4:** Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission. **CO5:** Learn about what to write in each section.	
Unit	**Syllabus**	**Periods**
UNIT-I	Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.	**8**
UNIT-II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	**9**

UNIT-III	Key skills needed when writing a Title, key skills needed when writing an Abstract, key skills Needed when writing an Introduction, skills needed when writing a Review of the Literature.	**11**
UNIT-IV	Skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills are needed when writing the Conclusions.	**13**
UNIT-V	Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.	**14**
	Text Books: **1.** Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press. **2.** Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.	
	Reference Books: **1.** Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books). **2.** Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London,2011.	

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SCHOOL OF ENGINEERING

SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	-	-	4	2
Subject Name		Power System Analysis Lab				
Subject Code		MEXPS20S113				
Paper	English					
	Hindi					
Max. Marks		50				

POWER SYSTEM ANALYSIS LAB

List of Experiments:

1. Power Systems & Power Electronics Lab.
2. Computer Simulation Lab.
3. Simulation of IGBT Inverters.
4. Simulation of Thyristor Converters.
5. Transient Stability Studies.
6. Short Circuit Studies.
7. Load Flow Studies.
8. Load Forecasting and Unit Commitment.

SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		I/I	-	-	4	2
Subject Name		POWER SYSTEM DYNAMICS-I Lab				
Subject Code		MEXPS20S114				
Paper	English					
	Hindi					
Max. Marks		50				

POWER SYSTEM DYNAMICS- I LAB

List of Experiments:

1. Power Curves.
2. Build a Wind Farm.
3. Test the Capabilities of the Hydrogen Fuel Cells and Capacitors.
4. Effect of Temperature on Solar Panel Output.
5. Variables Affecting Solar Panel Output.
6. Effect of Load on Solar Panel Output.
7. Wind Turbine Output: The Effect of Load.
8. Test the Capabilities of Solar Panels and Wind Turbines.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		DIGITAL PROTECTION OF POWER SYSTEM				
Subject Code		MEXPS20S201				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:-
Students will be able to:
1. Study of numerical relays Developing mathematical approach towards protection Study of algorithms for numerical protection.

Course Outcomes:
Students will be able to:
CO1. Learn the importance of Digital Relays.
CO2. Apply Mathematical approach towards protection.
CO3. Learn to develop various Protection algorithms.
CO4. Learn the importance of the sampling theorem.
CO5. Analyze the analog to digital conversion Digital filtering concepts.

Unit	Syllabus	Periods
UNIT-I	Evolution of digital relays from electromechanical relays Performance and operational characteristics of digital protection.	8
UNIT-II	Mathematical background to protection algorithms Finite difference techniques.	9
UNIT-III	Interpolation formulae Forward, backward and central difference interpolation Numerical differentiation Curve fitting and smoothing Least squares method Fourier analysis Fourier series and Fourier transform Walsh function analysis.	11
UNIT-IV	Basic elements of digital protection Signal conditioning: transducers, surge protection, analog filtering, analog multiplexers Conversion subsystem: the sampling theorem, signal aliasing.	13

UNIT-V	Error, sample and hold circuits, multiplexers, analog to digital conversion Digital filtering concepts, The digital relay as a unit consisting of hardware and software.	**14**

Text Books:

1. A.G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", Wiley/Research studies Press, 2009
2. S.R.Bhide "Digital Power System Protection" PHI Learning Pvt.Ltd.2014

Reference Books

1. A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press, 1999.
2. Gerhard Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		POWER SYSTEM DYNAMICS-II				
Subject Code		MEXPS20S202				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:-

Students will be able to:

1. Study of power system dynamics Interpretation of power system dynamic phenomena.
2. Study of various forms of stability.

Course Outcomes:

Students will be able to:

CO1. Gain valuable insights into the phenomena of power system including obscure ones.

CO2. Understand the power system stability problem.

CO3. Analyze the stability problems and implement modern control strategies.

CO4. Simulate small signal and large signal stability problems.

CO5. Understand dynamic analysis and voltage stability problem analysis.

Unit	Syllabus	Periods
UNIT-I	Basic Concepts of Dynamic Systems and Stability Definition Small Signal Stability (Low Frequency Oscillations) of Unregulated and Regulated System.	8
UNIT-II	Effect of Damper, Flux Linkage Variation and AVR.	9
UNIT-III	Large Signal Rotor Angle Stability Dynamic Equivalents And Coherency Direct Method of Stability Assessment Stability Enhancing Techniques Mitigation Using Power System Stabilizer.	11
UNIT-IV	Asynchronous Operation and Resynchronization Multi-Machine Stability.	13

UNIT-V	Dynamic Analysis of Voltage Stability Voltage Collapse Frequency Stability Automatic Generation Control Primary and Secondary Control Sub-Synchronous Resonance and Counter Measures.	**14**

Text Books:

1. P. Kundur, "Power System Stability and Control", McGraw Hill Inc, 1994
2. J. Machowski, Bialek, Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997

Reference Books

1. L. Leonard Grigsby (Ed.); "Power System Stability and Control", Second edition, CRC Press, 2007
2. V. Ajjarapu, "Computational Techniques for voltage stability assessment & control"; Springer, 2006

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		RESTRUCTURED POWER SYSTEMS				
Subject Code		MEXPS20S203				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives: -

Students will be able to:

1. Understand what is meant by restructuring of the electricity market
2. Understand the need behind requirement for deregulation of the electricity market
3. Understand the money, power & information flow in a deregulated power system

Course Outcomes: -

Students will be able to:

CO1. Describe various types of regulations in power systems.
CO2. Identify the need of regulation and deregulation.
CO3. Define and describe the Technical and Non-technical issues in Deregulated Power Industry.
CO4. Identify and give examples of existing electricity markets.
CO5. Classify different market mechanisms and summarize the role of various entities in the market.

Unit	Syllabus	Periods
UNIT-I	Fundamentals of restructured system Market architecture Load elasticity Social welfare maximization.	8
UNIT-II	OPF: Role in vertically integrated systems and in restructured markets congestion management.	9
UNIT-III	Optimal bidding Risk assessment Hedging Transmission pricing Tracing of power.	11
UNIT-IV	Ancillary services Standard market design Distributed generation in restructured markets Developments in India IT applications in restructured markets.	13

UNIT-V	Working of restructured power systems PJM, Recent trends in Restructuring.	**14**

Text Books:

1. LorrinPhilipson, H. Lee Willis, "Understanding electric utilities and de-regulation", Marcel Dekker Pub.,1998.
2. Steven Stoft, "Power system economics: designing markets for electricity", John Wiley and Sons, 2002.

Reference Books

1. Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, "Operation of restructured power systems", Kluwer Academic Pub., 2001.
2. Mohammad Shahidehpour, MuwaffaqAlomoush, "Restructured electrical power systems: operation, trading and volatility", Marcel Dekker.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		ADVANCED DIGITAL SIGNAL PROCESSING				
Subject Code		MEXPS20S204				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives: -

Students will be able to:

1. To understand the difference between discrete-time and continuous-time signals.
2. To understand and apply Discrete Fourier Transforms (DFT).

Course Outcomes: -

Students will be able to:

CO1. Knowledge about the time domain and frequency domain representations as well analysis of discrete time signals and systems.

CO2. Study the design techniques for IIR and FIR filters and their realization structures.

CO3. Acquire knowledge about the finite word length effects in implementation of digital filters.

CO4. Knowledge about the various linear signal models and estimation of power spectrum of stationary random signals.

CO5. Design of optimum FIR and IIR filters.

Unit	Syllabus	Periods
UNIT-I	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.	8
UNIT-II	Linear convolution using DFT Computation of DFT Design of IIR digital filters from analog filters Impulse invariance method Bilinear transformation method.	9
UNIT-III	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 quantization effects in IIR and FIR filters.	11

UNIT-IV	A/D conversion noise- Arithmetic round-off errors, Dynamic range scaling Optimum linear filters Optimum signal estimation, Mean square error estimation, Overflow oscillations and zeroInput limit cycles in IIR filters Linear Signal Models.	**13**
UNIT-V	All pole, All zero and Pole-zero models, Power spectrum estimation-Spectral analysis of deterministic signals. Estimation of power spectrum of stationary random signals Optimum FIR and IIR Filters.	**14**

Text Books:

1. Sanjit K Mitra, "Digital Signal Processing: A computer-based approach ",TataMc Grow-Hill Edition1998.
2. Dimitris G .Manolakis, Vinay K. Ingle and Stephen M. Kogon, "Statistical and Adaptive Signal Processing", Mc Grow Hill international editions. -2000.

Reference Books

1. Sanjit K Mitra, "Digital Signal Processing: A computer-based approach ",TataMc Grow-Hill Edition1998.
2. Dimitris G .Manolakis, Vinay K. Ingle and Stephen M. Kogon, "Statistical and Adaptive Signal Processing", Mc Grow Hill international editions. -2000.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		DYNAMICS OF ELECTRICAL MACHINES				
Subject Code		MEXPS20S205				
Paper	English					
	Hindi					
Max. Marks		100				

Course objective: -
Students will be able to-
1. Learn Performance characteristics of machine.
2. To understand the dynamics of the machine.
3. To understand how to determine stability of machine.
4. Learn the synchronous machine.

Course Outcomes: -Students will be able to:
CO1. Formulation of electrodynamic equations of all electric machines and analyze the performance characteristics.
CO2. Knowledge of transformations for the dynamic analysis of machines.
CO3. Knowledge of determination of stability of the machines under small signal and transient conditions.
CO4. Study about synchronous machine.

Unit	Syllabus	Periods
UNIT-I	Stability, Primitive 4 Winding Commutator Machine Commutator Primitive Machine Complete Voltage Equation of Primitive 4 Winding Commutator Machine.	8
UNIT-II	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.	9
UNIT-III	Three Phase Salient Pole Synchronous Machine Parks Transformation, Steady State Analysis.	11
UNIT-IV	Large Signal Transient Small Oscillation Equations in State Variable form Dynamical Analysis of Interconnected Machines.	13

UNIT-V	Large Signal Transient Analysis using Transformed Equations DC Generator /DC Motor System Alternator /Synchronous Motor System.	**14**

Text Books:

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.

Reference Books

1. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company,1987.
2. Boldia& S.A. Nasar,,"Electrical Machine Dynamics", The Macmillan Press Ltd. 1992.
3. C.V. Jones, "The Unified Theory of Electrical Machines", Butterworth, London. 1967.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		POWER APPARATUS DESIGN				
Subject Code		MEXPS20S206				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives: -

Students will be able to:

1. Study the modelling analysis of rotating machine.
2. Learning electromagnetic energy conversion.
3. To know about rating of machines.

Course Outcomes: -

Students will be able to:

CO1. Give a systematic approach for modeling.

CO2. Analyzes all rotating machines under both transient conditions.

CO3. Analyzes steady state conditions with the dimensions and material.

CO4. Model and design all types of rotation machines including special machines.

CO5. Design of stator and rotor winding.

Unit	Syllabus	Periods
UNIT-I	Principles of Design of Machines -Specific loadings, choice of magnetic and electric loadings Real and apparent flux densities, temperature rise calculation, Separation of main dimension for DC machines Induction machines and synchronous machines Design of Transformers-General considerations, output equation, emf per turn, choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling.	**8**
UNIT-II	Specific loadings, choice of magnetic and electric loadings Real and apparent flux -densities, temperature rise calculation Separation of main dimension for DC machines Induction machines and synchronous machines Heating and cooling of machines, types of ventilation,	**9**

	continuous and intermittent rating.	
UNIT-III	General considerations, output equation, emf per turn, choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling tubes Calculation of losses, efficiency and regulation Forces winding during short circuit.	**11**
UNIT-IV	General considerations, output equation Choice of specific electric and magnetic loadings, efficiency, power factor Number of slots in stator and rotor Elimination of harmonic torques.	**13**
UNIT-V	Design of stator and rotor winding, slot leakage flux Leakage reactance, equivalent resistance of squirrel cage rotor, Magnetizing current, efficiency from design data.	**14**

Text Books:

1. Clayton A.E, "The Performance and Design of D.C. Machines", Sir I. Pitman & sons, Ltd.
2. M.G. Say, "The Performance and Design of A.C. Machines ", Pitman.

Reference Book:

1. Sawhney A.K, "A course in Electrical Machine Design", Dhanpat Rai & Sons, 5th Edition.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		ADVANCED MICRO-CONTROLLER BASED SYSTEMS				
Subject Code		MEXPS20S207				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:-
Students will be able to:
1. Understand the architecture of advance microcontrollers.
2. Understand the applications of these controllers.
3. Get some introduction to FPOWER SYSTEMA.

Course Outcomes: -Students will be able to:
CO1. Learn how to program a processor in assembly language and develop an advanced processor based system.
CO2. learn configuring and using different peripherals in a digital system.
CO3. Compile and debug a Program.
CO4. Generate an executable file and use of it.
CO5. Learn about Digital Signal Processor.

Unit	Syllabus	Periods
UNIT-I	Basic Computer Organization Accumulator based Processes-Architecture Memory Organization-I/O Organization.	8
UNIT-II	Micro-Controllers-Intel 8051, Intel 8056- Registers, Memories I/O Ports, Serial Communication Timers, Interrupts, Programming.	9
UNIT-III	Intel 8051 – Assembly language programming Addressing-Operations Stack & Subroutines Interrupts-DMA.	11
UNIT-IV	PIC 16F877- Architecture Programming Interfacing Memory/ I/O Devices Serial I/O and data communication.	13

UNIT-V	Digital Signal Processor (DSP) Architecture – Programming Introduction to FPOWER SYSTEMA Microcontroller development for motor control applications Stepper motor control using micro controller.	**14**

Text Books:

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".

Reference Books

1. John Morton," The PIC microcontroller: your personal introductory course", Elsevier, 2005.
2. Dogan Ibrahim," Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		SCADA SYSTEM AND APPLICATIONS				
Subject Code		MEXPS20S208				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:-

Students will be able to:

1. Understand what is meant by SCADA and its functions.
2. Know SCADA communication.
3. Get an insight into its application.

Course Outcomes: -

Students will be able to:

CO1. Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications.

CO2. Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system.

CO3. Knowledge about single unified standard architecture IEC 61850.

CO4. Learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server.

CO5. Learn and understand about SCADA applications in transmission and distribution sector, industries etc.

Unit	Syllabus	Periods
UNIT-I	Introduction to SCADA Data acquisition systems Evolution of SCADA Communication technologies SCADA Applications: Utility applications Transmission and Distribution sector operations, monitoring, analysis and improvement Industries - oil, gas and water.	8
UNIT-II	Monitoring and supervisory functions SCADA applications in Utility Automation Industries SCADA.	9

UNIT-III	Industries SCADA System Components Schemes- Remote Terminal Unit (RTU) Intelligent Electronic Devices(IED) Programmable Logic Controller (PLC) Communication Network, SCADA Server, SCADA/HMI Systems.	**11**
UNIT-IV	SCADA Architecture Various SCADA architectures, advantages and disadvantages of each system single unified standard architecture -IEC 61850.	**13**
UNIT-V	SCADA Communication various industrial communication technologies wired and wireless methods and fiber optics Open standard communication protocols.	**14**

Text Books:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America. Publications, USA, 2004.
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870 and Related Systems", Newnes Publications, Oxford, UK, 2004.

Reference Books

1. Systems", Newnes Publications, Oxford, UK, 2004.
2. William T. Shaw, "Cyber security for SCADA systems", Penn Well Books, 2006.
3. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.
4. Michael Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power", Penn Well 1999.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		POWER QUALITY				
Subject Code		MEXPS20S209				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives: -
Students will be able to:

1. Understand the different power quality issues to be addressed.
2. Understand the recommended practices by various standard bodies like IEEE,IEC, etc on voltage& frequency, harmonics Understanding STATIC VAR Compensators.

Course Outcomes: -Students will be able to:

CO1. Acquire knowledge about the harmonics, harmonic introducing devices and effect of harmonics on system equipment and loads.
CO2. Develop analytical modeling skills needed for modeling and analysis of harmonics in networks and components.
CO3. Introduce the student to active power factor correction based on static VAR compensators and its control techniques.
CO4. Introduce the student to series and shunt active power filtering techniques for harmonics.
CO5. Introduce the student to series.

Unit	Syllabus	Periods
UNIT-I	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.	8

UNIT-II	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.	**9**
UNIT-III	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.	**11**
UNIT-IV	Power factor improvement- Passive Compensation Passive Filtering , Harmonic Resonance Impedance Scan Analysis- Active Power Factor Corrected Single Phase Front End.	**13**
UNIT-V	Control Methods for Single Phase APFC Three Phase APFC and Control Techniques, PFC Based on Bilateral Single Phase and Three Phase Converter.	**14**

Text Books:

1. G.T. Heydt, “Electric power quality”, McGraw-Hill Professional, 2007.
2. Math H. Bollen, “Understanding Power Quality Problems”, IEEE Press, 2000.

Reference Books

1. J. Arrillaga, “Power System Quality Assessment”, John wiley, 2000.
2. J. Arrillaga, B.C. Smith, N.R. Watson & A. R.Wood ,”Power system Harmonic Analysis”, Wiley, 1997.

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SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	3	-	-	3
Subject Name		ARTIFICIAL INTELLIGENCE TECHNIQUES				
Subject Code		MEXPS20S210				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:-
Students will be able to:
1. Understanding fuzzy logic, ANN.
2. Understanding GA & EP.

Course Outcomes: -Students will be able to:

CO1. Learn the concepts of biological foundations of artificial neural networks.
CO2. Learn Feedback networks and radial basis function networks and fuzzy logics.
CO3. Identifications of fuzzy and neural network.
CO4. Acquire the knowledge of GA.
CO5. Learn the concepts Applications of above mentioned techniques to practical problems.

Unit	Syllabus	Periods
UNIT-I	Biological foundations to intelligent Systems Artificial Neural Networks, Single layer and Multilayer Feed Forward NN LMS and Back Propagation Algorithm Feedback networks and Radial Basis Function Networks.	8
UNIT-II	Fuzzy Logic Knowledge Representation and Inference Mechanism Defuzzification Methods.	9
UNIT-III	Fuzzy Neural Networks some algorithms to learn the parameters of the network like GA System Identification using Fuzzy and Neural Network.	11
UNIT-IV	Genetic algorithm Reproduction cross over, mutation Introduction to evolutionary program.	13
UNIT-V	Applications of above mentioned techniques to practical problems.	14

Text Books:

1. J M Zurada , “An Introduction to ANN”, Jaico Publishing House.
2. Simon Haykins, “Neural Networks”, Prentice Hall.
3. Timothy Ross, “Fuzzy Logic with Engg. Applications”, McGraw. Hill.

Reference Books

1. Driankov, Dimitra, “An Introduction to Fuzzy Control”, Narosa Publication.
2. Golding, “Genetic Algorithms”, Addison-Wesley Publishing Com.

SYLLABUS

POWER SYSTEM

Class		M.TECH	L	T	P	C
Semester/Year		II/I	-	-	4	2
Subject Name		POWER SYSTEM QUALITY LAB				
Subject Code		MEXPS20S211				
Paper	English					
	Hindi					
Max. Marks		50				

POWER SYSTEM QUALITY LAB

List of Experiments:

1. Introduction to Power System Protection.
2. Impact of Induction Motor Starting on Power System.
3. Modeling of Differential Relay using MATLAB.
4. Radial Feeder Protection.
5. Parallel Feeder Protection.
6. Principle of Reverse Power Protection.
7. Differential Protection of Transformer.
8. To the study time vs. voltage characteristics of over voltage induction relay.

SYLLABUS

POWER SYSTEM

Class		M.TECH	L	T	P	C
Semester/Year		II/I	-	-	4	2
Subject Name		ARTIFICIAL INTELLIGENCE LAB/ SMART GRID LAB				
Subject Code		MEXPS20S212				
Paper	English					
	Hindi					
Max. Marks		50				

ARTIFICIAL INTELLIGENCE LAB/ SMART GRID LAB

List of Experiments:

1. Write A Program For Best First Search.
2. Write A Program to Generate the output for A* Algorithm.
3. Write a Program To Show the Tic Tac Toe Game for 0 and X.
4. Write A Program For Expert System By Using Forward Chaining.
5. Comparing the Search Methods.
6. Implement the Greedy Search Algorithm.
7. Implement the min-max Algorithm.
8. Adding a Heuristic.

SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	-	-	4	2
Subject Name		Mini Project				
Subject Code		MEXPS20S213				
Paper	English					
	Hindi					
Max. Marks:		50				

Course objective:

1. The students will be able to understand and apply the knowledge of management functions like planning, scheduling, executing and controlling to projects.

2. The students will be able to implement the safety aspects during the execution project.

Course Outcomes:

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

CO1: Recognize various engineering problems and techniques to solve them.

CO2: Reproduce the solution of the problems upon the need of society.

CO3: Cooperate to work within group.

CO4: Develop the writing and communication skills for various engineering problems.

CO5: Display lifelong learning.

Unit	Syllabus	Periods
	Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. Continuous assessment of Mini Project at Mid-Sem and End-Sem will be monitored by the departmental committee.	

EKLAVYA UNIVERSITY
ज्ञान प्राप्तये लक्ष्य संधानम्
Estd. by Madhya Pradesh Niji Vishvavidyalaya (Sthapna Evam Sanchalana) Adhyadesh, 2020

SCHOOL OF ENGINEERING

SYLLABUS

POWER SYSTEM

Class		M.TECH.	L	T	P	C
Semester/Year		II/I	2	-	-	-
Subject Name		Stress Management by Yoga				
Subject Code		MEXPS20S214				
Paper	English					
	Hindi					
Max. Marks:		-				

Course Objective:
After completing this module, you should be able to:
1. To achieve overall health of body and mind.
2. To overcome stress.

Course Outcomes:
After completion of course, students would be able to:
CO1: Develop healthy mind in a healthy body thus improving social health.
CO2: Improve efficiency.

Unit	Syllabus	Periods
UNIT-I	Definitions of Eight parts of yog. (Ashtanga)	8
UNIT-II	Yam and Niyam Do`s and Don'ts in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha. ii) Shaucha, santosh, tapa, swadhyay,is hwarpranidhan.	9
UNIT-III	Asan and Pranayam: - i) Various yog poses and their benefits for mind &body. **ii)**Regularization of breathing techniques and its effects-Types of pranayam.	11
	Reference Books: 1. Yogic Asanas for Group Tarining part- I Janardan Swami Yoga bhyasi Mandal Nagpur**.** 2. Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.	