SEMMESTER – I

<table>
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*PE = Program Elective

List of Programme Electives:

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<td>1.</td>
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List of Audit I/II

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<td>8.</td>
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Notes:

1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.

2. Electronics gadgets including cellular phones are not allowed in the examination.

3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
### Scheme of Studies & Examinations, w.e.f. 2018-19.

**SEMESTER – 2**

<table>
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*PE = Program Elective

**List of Programme Electives:**

**PE3**

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**PE4**

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**List of AUDIT-I/II**

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Approved in the 13th meeting of Academic Council held on 18/06/2018.
Notes:-
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DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY,
MURTHAL (SONIPAT)-131039
SCHEME OF STUDIES & EXAMINATIONS FOR
M. Tech. in Electrical Engineering (Power Systems)
Choice Based Credit System

Scheme of Studies & Examinations, w.e.f. 2019-20.

SEMESTER – 3

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*PE = Program Elective
*OE = Open Elective

List of Programme Electives

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M.TECH. ELECTRICAL ENGINEERING (POWER SYSTEM) SEMESTER – I
Choice Based Credit System (Effective from Session 2018-2019)
COURSE CODE: MP8501C CATEGORY: PROGRAM CORE COURSE

COURSE TITLE: POWER SYSTEM ANALYSIS

L T P
3 -  -

Class work Marks: 25 Marks
Exam Marks: 75 Marks
Total Marks: 100
Duration of Exam: 3 hours
Credits: 3

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

UNIT 1

LOAD FLOW STUDIES: Overview of Gauss-Siedel and Newton-Raphson method of load flow studies, Decoupled and fast decoupled methods, D.C. load flow, convergence properties, sparsity techniques, handling Qmax violations in constant matrix, AVR in load flow, Load flow in distribution systems.

UNIT 2

SYMMETRICAL AND UNSYMMETRICAL FAULT ANALYSIS: Symmetrical Components, Sequence networks for synchronous machines, transformers and transmission lines, Symmetric fault analysis using bus impedance matrix, Unsymmetrical fault analysis using bus impedance matrix, and Consideration of Pre fault currents.

UNIT 3


UNIT 4

STATE ESTIMATION: Data Collection from Power System, Sources of errors in measurement, Method of Least square, Method of Standard Deviation, Detection and Identification of Bad Data Measurements, Network Observability and Pseudo-measurements.

Suggested reading


Approved in the 13th meeting of Academic Council held on 18/06/2018.

Course outcomes-

Students will be able to:

1. Able to calculate voltage phasors at all buses, given the data using various methods of load flow
2. Able to calculate fault currents in each phase
3. Rank various contingencies according to their severity
4. Estimate the bus voltage phasors given various quantities viz. power flow, voltages, taps, CB status, etc.

Notes:

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M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-I
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS503C

Category: Programme Core Course

COURSE TITLE: FACTS AND CUSTOM POWER DEVICES

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Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam.: 3 hours
Credits: 3

Course Objectives:- Students will be able to:
1. To learn the active and reactive power flow control in power system
2. To understand the need for static compensators
3. To develop the different control strategies used for compensation

UNIT 1

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 Static series compensation: TSSC, SSJC - 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

UNIT 3
SSR and its damping, Unified Power Flow Controller, Circuit Arrangement, Operation and control of UPFC, Basic Principle of P and Q control, Independent real and reactive power flow control- Applications. Voltage swells, sags, flicker, unbalance and mitigation of these problems by power line conditioners, IEEE standards on power quality.

UNIT 4
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

Suggested reading

Course Outcomes: -
Students will be able to:


Approved in the 13th meeting of Academic Council held on 18/06/2018.
2. Learn various Static VAR Compensation Schemes like Thyristor/GTO Controlled Reactive Power Systems; PWM_Inverter based Reactive Power Systems and their controls.
3. To develop analytical modeling skills needed for modeling and analysis of such Static VAR Systems.

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M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER - I

Choice Based Credit System (Effective from Session 2018-19)

**COURSE CODE:** MPS521C  
**CATEGORY:** PROGRAMME ELECTIVE COURSE

**COURSE TITLE:** RENEWABLE ENERGY SYSTEM

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Class Work Marks: 25 marks  
Exam Marks: 75 marks  
Total Marks: 100 marks  
Duration of Exam: 3 hours  
Credits: 3

**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

**Unit I**

**Unit II**
Wind Power Generation

**Unit III**
Solar Power Generation

**Unit IV**
Network Integration Issues
Network Integration Issues of distributed generation, Overview of grid code technical requirements. Protection issues of distributed generation, Power quality issues of distributed generation. Solar PV and wind farm behavior during grid disturbances. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits.

**Suggested Reading**

Approved in the 13th meeting of Academic Council held on 18/06/2018.
**Course Outcomes:** - Students will be able to:
1. Knowledge about renewable energy
2. Understand the working of distributed generation system in autonomous/grid connected modes
3. Know the Impact of Distributed Generation on Power System

**Notes:**
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
COURSE CODE: MPS523C
COURSE TITLE: HIGH POWER CONVERTERS

L  T  P
3  -  -

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam. : 3 hours
Credits: 3

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

UNIT 1
Power electronic systems, an overview of PSDs, multipulse diode rectifier: Six-Pulse Diode Rectifier Capacitive Load, Definition of THD and PF, Per-Unit System, THD and PF of Six-Pulse Diode Rectifier, multipulse SCR rectifier.

UNIT 2
Phase shifting transformers: Y/Z-1 Transformers, Y/Z-2 Transformers, Z Transformer, multilevel voltage source inverters: two level voltage source inverter, cascaded H bridge multilevel inverter, and PWM current source inverters

UNIT 3
Diode clamped multilevel inverters, flying capacitor multilevel inverter, Three-Level Inverter: Converter Configuration, Switching State, Commutation, High-Level Diode-Clamped Inverters: Four- and Five-Level Diode-Clamped Inverters, Carrier-Based PWM

UNIT 4
DC to DC switch mode converters, AC voltage controllers: Cycloconverters, matrix converter, Power conditioners and UPS, Design aspects of converters, protection of devices and circuits

Suggested reading

Course Outcomes:-
Students will be able to:
1. Learn the characteristics of PSDs such as SCRs, GTOs, IGBTs and use them in practical systems
2. Knowledge of working of multi-level VSIs, DC-DC switched mode converters, cyclo-converters and PWM techniques and the ability to use them properly
3. Acquire knowledge of power conditioners and their applications
4. Ability to design power circuit and protection circuit of PSDs and converters

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER - I
Choice Based Credit System (Effective from Session 2018-19)

CATEGORY: PROGRAMME ELECTIVE COURSE

COURSE CODE: MPS525C
COURSE TITLE: WIND AND SOLAR SYSTEMS

L  T  P
3  -  -

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam.: 3 hours
Credits: 3

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.
3. Learning the dynamics involved when interconnected with power system grid

UNIT 1
Historical development and current status, characteristics of wind power generation, network integration issues, Incentives for Renewables, Modularity for Growth, Emission Benefits, Consumer Choice.

UNIT 2
Generators and power electronics for wind turbines, power quality standards for wind turbines, System control requirements: Speed Control, Rate Control, Technical regulations for interconnections of wind farm with power systems.

UNIT 3
Isolated wind systems, reactive power and voltage control, economic aspects, Environmental Aspects: Audible Noise, Electromagnetic Interference (EMI), Effects on Birds, Other Impacts, Impacts on power system dynamics, power system interconnection.

UNIT 4
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

Suggested reading

Course Outcomes:-
Students will be able to:
1. Appreciate the importance of energy growth of the power generation from the renewable energy sources and participate in solving these problems
2. Demonstrate the knowledge of the physics of wind power and solar power generation and all associated issues so as to solve practical problems
3. Demonstrate the knowledge of physics of solar power generation and the associated issues
4. Identify, formulate and solve the problems of energy crises using wind and solar energy

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M. TECH. IN ELECTRICAL ENGG. (POWER SYSTEMS), SEMESTER-I
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS527C CATEGORY: PROGRAMME ELECTIVE COURSE

COURSE TITLE: ELECTRIC POWER DISTRIBUTION SYSTEM

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<td>Exam Marks : 75</td>
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COURSE OBJECTIVES:
1. Learning about power distribution system
2. Learning of Energy Audit for improvement in existing power distribution system.
4. Learning about Need based energy system

DETAILED CONTENTS:

UNIT-I

UNIT-II

UNIT-III
ENERGY AUDIT IN DISTRIBUTION SYSTEM: Energy Accounting: Need, objectives & functions, Energy flow diagram in power distribution system, energy accounting procedure, Energy Audit: Definition, Objectives and functions, Energy Auditing steps, Scope of Energy Audit, Concepts of AT&C losses in distribution system, factors contributing to high technical & commercial losses. Measures for Technical and commercial loss reduction, long term plans for technical loss reduction, acceptable technical loss levels, case studies. (14 hours)

UNIT-IV
ENERGY MANAGEMENT: Types, Need Based Energy Management (NBEM) – Objectives, Advantages. Demand Side Management (DSM): Definition, Objectives, Features, Steps in DSM, Technologies used in DSM, Implementation of DSM, DSM on consumer side – the industrial sector, the agricultural sector, the domestic & commercial sectors, Case Studies (10 hours)

TEXT BOOKS:

Approved in the 13th meeting of Academic Council held on 18/06/2018.
COURSE OUTCOMES:
After going through this course, the student shall be able to:
1. Knowledge of power distribution system
2. Study of Distribution automation and its application in practice
3. Knowledge of Energy Audit and real case studies related to energy audit in power distribution system.
4. Knowledge of Need Based Energy Management and case studies based on DSM.

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M.TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-I
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS529C  CATEGORY: PROGRAMME ELECTIVE COURSE
COURSE TITLE: MATHEMATICAL METHODS FOR POWER ENGINEERING

L T P Class Work Marks: 25
3 - - Exam Marks: 75

Total Marks: 100
Duration of Exam.: 3 hours
Credits: 3

COURSE OBJECTIVES: Students should be able to:
1. To understand the relevance of mathematical methods to solve engineering problems.
2. To understand how to apply these methods for given engineering problems.

DETAILED CONTENTS:

UNIT 1
Vector spaces; Linear dependence & linear independence of vectors; Linear transformations, Matrix representation of linear transformation; Orthogonal transformation;

(10 hours)

UNIT 2
Characteristic equation; Eigen values and Eigen vectors of linear operator; Generalized eigenvector; Properties of eigen values; Reduction of matrix to a diagonal form; Diagonalizing or Modal matrix; Vandermonde matrix and modified Vandermonde matrix;

(10 hours)

UNIT 3
Linear Programming Problems; Simplex Method; Duality; Non Linear Programming problems; Unconstrained Problems; Search methods; Heuristic search; Constrained Problems.

(11 hours)

UNIT 4
Lagrange method; Kuhn-Tucker conditions; Random Variables; Elements of stochastic processes; White noise; Distributions; Independent Random Variables; Marginal and Conditional distributions.

(12 hours)

Suggested reading:
2. Erwin Kreyszig, “Introductory Functional Analysis with Applications”, John Wiley & Sons..
3. Irwin Miller and Marylees Miller, John E. Freund’s “Mathematical Statistics”, 6th Edn, PHI.

COURSE OUTCOMES: Upon going through this course, students will be able to:
1. Know about vector spaces, linear transformation, eigenvalues and eigenvectors of linear operators.
2. Learn about linear programming problems & understand the simplex method for solving linear programming problems in fields of engg. and technology.
3. Acquire knowledge about nonlinear programming and various techniques used for solving Constrained and unconstrained nonlinear programming problems.
4. Understand the concept of random variables, functions of random variable and their Probability distribution.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
5. Understand stochastic processes and their classification.

Notes:
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.

2. Electronics gadgets including cellular phones are not allowed in the examination.

3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
COURSE CODE: MPS531C    CATEGORY: PROGRAMME ELECTIVE COURSE
COURSE TITLE: ELECTRIC AND HYBRID VEHICLES

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Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam. : 3 hours
Credits: 3

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

UNIT 1
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

UNIT 2
Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis, matching the electric machine and the internal combustion engine (ICE) the energy storage technology, Communications, supporting subsystems

UNIT 3
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.

UNIT 4
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

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

Course Outcomes:-
Students will be able to:
1. Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2. To learn electric drive in vehicles /traction.

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-I
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS519C

COURSE TITLE: RESEARCH METHODOLOGY AND IPR

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam.: 3 hours
Credits: 2

Course Outcomes:
At the end of this course, students will be able to understand research problem formulation. Analyze research related information, follow research ethics, understand that today’s world is controlled by computer, information technology, but tomorrow world will be ruled by ideas, concept, and creativity. Nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. 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 1
Meaning of research problem, Sources of research problem, 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 instrumentation

Unit 2
Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 3

Unit 4
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.

References:
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-I

Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPSS81C  CATEGORY: LAB 1

COURSE TITLE: POWER SYSTEM STEADY STATE ANALYSIS LAB

L  T  P
-  -  4  

Class Work Marks: 25 marks

Exam Marks: 75 marks

Total Marks: 100 marks

Credits: 2

List of experiments:
1. Understanding various Commands of MATLAB and solving simple DC circuit through MATLAB.
2. Develop program in MATLAB using Gauss-Seidel Method and solve a given P. S. Network problem.
3. Develop program in MATLAB using Fast-Decoupled Method and solve a given P. S. Network problem.
4. Develop program in MATLAB for formation of Z-bus by modification method. Form the Z-bus for a given network manually as well as through Program and match the results.
5. Develop program in MATLAB for Fault current, bus voltages and line currents for (i) 3-phase symmetrical Fault (ii) Single Line to ground fault (iii) Line to Line fault (iv) Double line to ground fault.
6. Develop program in MATLAB for calculation of optimal dispatch, Fuel Cost by (i) analytical method (ii) graphical demonstration method, neglecting linelosses.
7. Develop program in MATLAB for calculating state Estimation and solve a given network manually and using the program and match the results.
8. Develop program in MATLAB for calculation of generator shift distribution factors.
9. Develop program in MATLAB for calculation of line outage distribution factors.
10. Write a program for plotting Power – Delta curve for fault occurs in network (solving of swing equation).

NOTES:-
1. Each Laboratoty Class / Section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either be done by each student individually or in a group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Pre-experimental & post-experimental quiz / questions may be offered for each Lab. experiment to reinforce and aid comprehension of the experiment.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
M.TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-I
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS583 C
COURSE TITLE: RENEWABLE ENERGY LAB

L T P  
- - 4

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Credits: 2

List of experiments:
1. To draw the Power Curves of wind turbines using MATLAB or other similar software.
2. To forecast the wind power using historical data.
3. To forecast the load of a utility using time series method.
4. To design a Wind Farm and give its layout and rating of equipments using WINSYS or other similar software.
5. To study the performance of a wind power plant.
6. To design a solar power plant and give its layout and rating of equipments using PV SYS or other similar software.
7. To study the performance of a solar power plant.
8. To study the effect of Temperature on Solar Panel Output and other Variables Affecting Solar Panel Output
9. To simulate the variation of voltage and frequency in micro grid having solar and wind distributed generators
10. To simulate the distance protection of distributed generator in a local distribution system.

NOTES:-
1. Each Laboratory Class / Section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either be done by each student individually or in a group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Pre-experimental & post-experimental quiz / questions may be offered for each Lab. experiment to reinforce and aid comprehension of the experiment.
Course Objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability,
2. Learn about what to write in each section,
3. Understand the skills needed when writing a Title, and
4. Ensure the good quality of paper at very first-time submission

Course Outcomes:
The Students will become conscious citizens of India aware of their duties, rights and functions of various bodies of governance and welfare; thereby well equipped to contribute to India.

UNIT I: Basics of Writing Skills:
Subject Verb Agreements; Parallelism; Structuring Paragraphs and Sentences; Being Concise and Removing Redundancy; Avoiding Ambiguity and Vagueness; Dangling Modifiers

UNIT II: Reviewing and Citation:
Clarifying Who Did What; Highlighting Your Findings from Literature; Hedging and Critiquing; Paraphrasing; Avoiding Plagiarism; Formatting and Citation (Publication Manual of the American Psychological Association)

UNIT III: Sections of a Research Paper:
Writing Effective and Impressive Abstract; Writing Introduction; Review of Literature; Defining Objectives of the Study; Methodology Adopted; Results Obtained; Discussion and Conclusion; Editing and Proof Reading to Ensure Quality of paper

UNIT IV: Oral Presentation for Academic Purposes:
Oral Presentation for Seminars, Conferences and Symposiums; Poster Presentation; Choosing Appropriate Medium; Interaction and Persuasion

TEXT / REFERENCE BOOKS:

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
AUD533C: DISASTER MANAGEMENT
M. Tech. Semester – I/II (Common for all Branches)

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Course Objectives:
1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
4. Critically understand different aspects of disaster management

Course Outcomes:
A student will be able to:

1. Know the significance of disaster management,
2. Study the occurrences, reasons and mechanism of various types of disaster
3. Learn the preventive measures as Civil Engineer with latest codal provisions
4. Apply the latest technology in mitigation of disasters

UNIT I: Chronological Development: Introduction to Disaster Management: Definitions: Disaster, Emergency, Hazard, Mitigation, Disaster Prevention, Preparedness and Rehabilitation, Risk and Vulnerability, Classification of Disaster, Natural and Man-made Disasters, Disaster Management Act 2005, Role of NDMA, NDRF, NIDM

Risk and Vulnerability to disaster mitigation and management options: Concept and Elements, Risk Assessment, Vulnerability, Warning and Forecasting.

UNIT II: Hydro-meteorological based disasters I: Tropical Cyclones, Floods, droughts, mechanism, Causes, role of Indian Meteorological Department, Central Water Commission, structure and their impacts, classifications, vulnerability, Early Warning System, Forecasting, Flood Warning System, Drought Indicators, recurrence and declaration, Structural and Non-structural Measures.

Hydro-meteorological based disasters II: Desertification Zones, causes and impacts of desertification, Characteristics, Vulnerability to India and Steps taken to combat desertification, Prevention.

UNIT III: Geological based disasters: Earthquake, Reasons, Direct and Indirect Impact of Earthquake; Seismic Zones in India, Factors, Prevention and Preparedness for Earthquake, Tsunamis, Landslides and avalanches: Definition, causes and structure; past lesson learnt and measures taken; their Characteristic features, Impact and prevention, structural and non-structural measures.

UNIT IV: Manmade Disasters I: Chemical Industrial hazards; causes and factors, pre- and post disaster measures; control; Indian Standard Guidelines and Compliance; Oil Slicks and Spills, Outbreak of Disease and Epidemics, Traffic

Approved in the 13th meeting of Academic Council held on 18/06/2018.
accidents; classification and impact, War and Conflicts; Fire risk assessment; Escape routes; fire fighting equipment; **Use of remote sensing and GIS** in disaster mitigation and management.

**TEXT / REFERENCE BOOKS:**
5. Savindra Singh and Jeetendra Singh, Disaster Management, Pravalika Publications, Allahabad
7. Selected Resources Published by the National Disaster Management Institute of Home Affairs, Govt. of India, New Delhi.

**NOTE:**
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
AUD535C: SANSKRIT FOR TECHNICAL KNOWLEDGE
M. Tech. Semester – I/II (Common for all Branches Engineering)

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Course Objectives:
1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in Mathematics, Science & other subjects
4. Enhancing the memory power

Course Outcomes:
Students will be able to
1. Understand basic Sanskrit language
2. Understand Ancient Sanskrit literature about science and technology
3. Get equipped with Sanskrit and explore the huge knowledge from ancient literature

TEXT/REFERENCE BOOKS:
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Pratha Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
AUD537C: VALUE EDUCATION
M. Tech. Semester – I/II (Common for all Branches)

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Course Objectives:
The students will be able to
1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character

Course Outcomes:
The students will be able to
1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality
4. Strengthen the “EQ”

Syllabus contents:

Unit I: Hierarchy and Classification of values, Values and Belief Systems, Competence in professional ethics, Value judgment based on cultural, tradition and interdependence.

Unit II: Need for value education Sense of duty. Devotion, Self-reliance. Honesty, Humanity, trust. Patriotism and national Unity. Harmony in the nature and realization of coexistence Vision of better India


TEXT / REFERENCE BOOKS:
3. Value Education in Spirituality- Course-I, course -II by Brahma Kumaris Education Wing, Rajyoga Education & Research Foundation, Mount Abu, Rajasthan.

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
AUD539C: CONSTITUTION OF INDIA
M. Tech. Semester – I/II (Common for all Branches)

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**Course Objectives:**
Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:**
The Students will become conscious citizens of India aware of their duties, rights and functions of various bodies of governance and welfare; thereby well equipped to contribute to India.

**Syllabus contents:**

**Unit I:** Making of the Indian Constitution and its Philosophy
Sources of Indian Constitution, its Preamble and Salient Features.

**Unit II:** 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
Fundamental Duties

**Unit III:** Organs of Governance
Legislature: Parliament and its Composition; Qualifications and Disqualifications of Its members
Executive: President, Governor and Council of Ministers
Judiciary: Appointments, Qualifications, Powers and Functions of judges

**Unit IV:** Local Administration and institutes for welfare
District Administration Head: Role and Importance; Municipalities: Introduction, Mayor and role of Elected Representative
Panchayati Raj Institutions: Introduction, Gram Panchayat, Panchayat Samiti and Zila Panchayat Institutes and Bodies for the welfare of SC/ST/OBC and women

**TEXT / REFERENCE BOOKS:**
1. The Constitution of India, 1950 (Bare Act), Government Publication.

**NOTE:**
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
AUD51C: PEDAGOGICAL STUDIES  
M. Tech. Semester – I/II (Common for all Branches) 

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**Course Objectives:**
The course will enable the student teachers:
1. To understand the concept of pedagogy and conceptual framework.
2. To gain insight on the meaning and nature of different pedagogies.
3. To determine aims and strategies of teaching-learning.
4. To understand the principals, maxims of successful teaching and the different methods of teaching.
5. Comprehend the need and importance of various devices of teaching and learning and their relationship between the two.
6. Point out and illustrate the difference between teaching and learning and their relationship between the two.
7. To appreciate that science/engineering is a dynamic and expanding body of knowledge.

**Course Outcomes:**
Students will be able to understand:
1. It will improve teaching effectiveness of prospective teachers.
2. A prospective teacher will be able to design curriculum and assess the curriculum of their discipline in an effective way by understating the needs of the learners.
3. How can teacher education, school curriculum and guidance support effective pedagogy?
4. It will be functional for professional development among teachers.

**Syllabus contents:**

**Unit I:** Introduction and Methodology
- Aims and Rationale, Conceptual Framework, Terminology related to Pedagogy
- Contexts, Research Questions
- Theories of Learning, Curriculum, Scope of Pedagogy

**Unit II:** Teaching
- Meaning and importance of Behavioral Objectives
- Writing of Objectives in Behavioral Terms
- Phases and Variables of Teaching
- Principles, levels and maxims off teaching
- Relationship between Teaching and Learning

**Unit III:** Methods of Teaching
- Methods: Inductive, Deductive, Project, Analytic, Synthetic, Brain Storming, Case Discussion
- Concept and Significance of Individualized and Cooperative Teaching-Language Laboratory, Tutorials, Keller’s Plan (PSI), Computer Supporting Collaborative Learning
- Mastery Learning: Concept, Basic Elements, Components and Types of Mastery Learning Strategies

**Unit IV:** Evaluation Strategies
- Evaluation in Teaching: Concept of Evaluation, Relationship between Teaching and Evaluation, Types of Evaluation (Formative and Summative)
- Methods of Evaluation through Essay Type. Objective Type and Oral Method, Comparative merits and demerits of evaluation methods
- Latest Trends in Evaluation

**TEXT / REFERENCE BOOKS:**

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
AUD543C: STRESS MANAGEMENT BY YOGA
M. Tech. Semester – I/II (Common for all Branches)

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Course Objectives:
1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes:
Students will be able to:
1. Develop healthy mind and healthy body thus improving social health also
2. Improve efficiency
3. Improving “SQ”

Syllabus contents:

Unit I:
2. Difference and relation b/w Yog and Yoga,
3. benefits of meditation and Yoga,
4. Rules and Regulation of Yog and Yoga.
5. Empowerment of Soul and fitness of body.

Unit II:
1. Do’s and Don’t’s in life.
2. How to be and not to be?
3. Understanding spirituality and materials.
4. Impact of: Truth at mouth/ Truth in thoughts
   Non Violence outside / Compassion in thoughts, Celibacy (kamnayn- desire), purity of mind , non-covetousness, Cleanliness, satisfaction, self study and surrender to almighty, Austerity, Penance

Unit III:
Role of Meditation in reducing Stress.
Role of Yoga in reducing Stress.
Pranyama: AnulomVilom ,Ujjai, Costal Breathing, Abdominal Breathing, Sunyak, Kumbbak

Unit IV:

TEXT / REFERENCE BOOKS:
1. ‘Yogic Asanas for Group Tarining-Part-I”: Janardan Swami Yogabhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama, (Publication Department), Kolkata
3. “Value Education in Spirituality- Course-IV” by Brahma Kumaries Education Wing, Rajyoga Education Research Foundation, Mount Abu, Rajasthan.
4. “Stress Management for Dummies” by Allen Elkin, IDG Books India (P) Ltd.
5. “Yoga Courses for All” by Dr Hansraj Yadav, BhartyaVidyaBhawan, Mumbai

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
AUD545C: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
M. Tech. Semester – I/II (Common for all Branches)

L | P | Credits | Class Work | Examination | Total | Duration of Examination
---|---|---------|------------|-------------|-------|-------------------------
2 | -- | -- | : 25Marks | : 75 Marks | : 100 Marks | : 3 Hours

Course Objectives:
Students will be able to:
1. To learn and achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Course Outcomes:
1. The study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
3. Study of Neetishatakam will help in developing versatile personality of students.

Syllabus contents:

Unit I: Holistic Development of Personality
Neetisatakam-Verses 19, 20, 21, 22 (Wisdom), Verses 29, 31 32 (Pride and Heroism) , Verses 26, 28, 63, 65 (Virtue)

Unit II: Approach to Day to Day Work and Duties
Shrimad BhagwadGeeta: Chapter 2 (Verses- 41, 47, 48), Chapter 3 (Verses- 13, 21, 27, 35), Chapter 6 (Verses- 05, 13, 17, 23, 35), Chapter 18 (Verses- 45, 46, 48)

Unit III: Statements of Basic Knowledge
Shrimad BhagwadGeeta: Chapter 2 (Verses- 56, 62, 68), Chapter 12 (Verses- 13, 14, 15, 16, 17, 18)

Unit IV: Personality of a Role Model
Shrimad BhagwadGeeta: Chapter 2 (Verses- 17), Chapter 3 (Verses 36, 37, 42), Chapter 4 (Verses 18, 38, 39), Chapter 18 (Verses 37, 38 63)

TEXT / REFERENCE BOOKS:
1. Srimad Bhagavad Gita by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringer-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
SECOND SEMESTER
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-II
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS502C
COURSE TITLE: DIGITAL PROTECTION OF POWER SYSTEM

L T P Class Work Marks: 25 marks
3 - - Exam Marks: 75 marks

Total Marks: 100 marks

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

UNIT 1

UNIT 2
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

UNIT 3
Basic elements of digital protection, Signal conditioning: transducers, surge protection, analog filtering, analog multiplexers, Conversion subsystem: the sampling theorem, signal aliasing Error, sample and hold circuits, multiplexers, analog to digital conversion, Digital filtering concepts, The digital relay as a unit consisting of hardware and software

UNIT 4
Sinusoidal wave based algorithms, Sample and first derivative (Mann and Morrison) algorithm. Fourier and Walsh based algorithms

Suggested reading

Course Outcomes:-
1. Learn the importance of Digital Relays
2. Apply Mathematical approach towards protection
3. Learn to develop various Protection algorithms

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.

2. Electronics gadgets including cellular phones are not allowed in the examination.

3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-II
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS504C     CATEGORY: PROGRAMME CORE COURSE
COURSE TITLE: POWER SYSTEM DYNAMICS

L   T   P
3   -   -

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam.: 3 hours
Credits: 3

Course Objectives:- Students will be able to:
1. Study of power system dynamics
2. Interpretation of power system dynamic phenomena
3. Study of various forms of stability

UNIT 1
Synchronous Machines: Per unit systems, Park’s Transformation (modified), Flux-linkage equations, Modeling of Induction Motors, Voltage and current equations, Formulation of State-space equations, Equivalent circuit.

UNIT 2

UNIT 3
Automatic Generation Control, Primary and Secondary Control, Application of PID and optimal controller on AGC, Dynamic Analysis of Voltage Stability, Voltage Collapse, Voltage Collapse proximity Indicator, Various types of Excitation systems and their state space models.

UNIT 4
Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines Small signal model, Sub-Synchronous Resonance and Counter Measures, Mitigation of SSR Using Power System Stabilizer and other techniques,

Suggested reading

Course Outcomes:-
Students will be able to:
1. Gain valuable insights into the phenomena of power system including obscure ones.
2. Understand the power system stability problem.
3. Analyze the stability problems and implement modern control strategies.
4. Simulate small signal and large signal stability problems.

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M.TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-II
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS520C CATEGORy: PROGRAMME ELECTIVE COURSE
COURSE TITLE: RESTRUCTURED POWER SYSTEMS

L T P
1 - - Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam: 3 hours
Credits: 3

Description & Objectives: The fundamental operation of restructured power system is described. Unbundling of these functions and cost allocations are discussed. Topics of ancillary services, power marketing, transmission pricing are covered. The objectives of this course include the following:-

(i) Provide an in-depth coverage of operations of restructuring power system.

(ii) Present basic principles of economics of power system with an emphasis on recent research areas.

Outcomes: This course is assessed through assignments, surprise tests, Quiz tests, minor tests and main examination. This course will provide students with a solid understanding of the basic engineering and economic terms, issues, and methods of analysis necessary to be successful in present electricity markets.

Unit-I


Unit-II


Unit -III

Unit-IV


TEXT BOOKS:


Reference:

1. Consultation Paper on Introducing Competition in Generation of Electricity by Central Electricity, Regulatory Commission 7th Floor, Core-3, Scope Complex, 7 Institutional Area, Lodhi Road, New Delhi-110003, August 2004.


Notes:-

1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.

2. Electronics gadgets including cellular phones are not allowed in the examination.

3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-II
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS522C
COURSE TITLE: DYNAMICS OF ELECTRICAL MACHINES

CLASSROOM WORK AND EXAM MARKS:
Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam: 3 hours
Credits: 3

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

UNIT 1

UNIT 2
Torque Equation Analysis of Simple DC Machines using the Primitive, Machine Equations, The Three Phase Induction Motor, Transformed Equation, Different Reference Frames for Induction Motor Analysis Transfer, Function Formulation

UNIT 3
Three Phase Salient Pole Synchronous Machine, Parks Transformation, Steady State Analysis, Alternator/Synchronous Motor System

UNIT 4
Large Signal Transient, Small Oscillation Equations in State Variable form, Dynamical Analysis of Interconnected Machines, Large Signal Transient Analysis using Transformed Equations, DC Generator/DC Motor System

Suggested reading

Course Outcomes:
1: Formulation of electrodynamic equations of all electric machines and analyze the performance characteristics
2: Knowledge of transformations for the dynamic analysis of machines
3: Knowledge of determination of stability of the machines under small signal and transient conditions
4: Study about synchronous machine

Notes:
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-II
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS524C  CATEGORY: PROGRAMME ELECTIVE COURSE
COURSE TITLE: SCADA SYSTEM AND SMART GRID

L  T  P  Class Work Marks: 25 marks
3  -  -  Exam Marks: 75 marks
                     Total Marks: 100 marks
                     Duration of Exam: 3 hours
                     Credits: 3

Course Objectives:- Students will be able to:
1. To understand what is meant by SCADA and its functions
2. To know SCADA communication
3. To get an insight into its application

UNIT 1
Introduction to SCADA, Data acquisition systems Evolution of SCADA, Communication technologies,
Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

UNIT 2
Industries SCADA System Components, Schemes- Remote Terminal Unit (RTU), Intelligent Electronic
Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI
Systems

UNIT 3
SCADA Architecture, Various SCADA architectures, advantages and disadvantages of each System
single unified standard architecture – IEC 61 50.
SCADA Communication, various industrial communication technologies, wired and wireless methods and fiber
optics, Open standard communication protocols

UNIT 4
SCADA Applications: Utility applications, Transmission and Distribution sector operations, monitoring, analysis
and improvement, Industries - oil, gas and water, Case studies, Implementation, Simulation Exercises

Suggested reading
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, 60 70.5 and Related
   PennWell 1999

Course Outcomes:-
Students will be able to:
1. Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications
2. Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system
3. Knowledge about single unified standard architecture IEC 61 50
4. To learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices,
   HMI systems, SCADA server
5. Learn and understand about SCADA applications in transmission and distribution sector, industries etc
Notes:-

1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.

2. Electronics gadgets including cellular phones are not allowed in the examination.

3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M.TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-II
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS526C  CATEGORY: PROGRAMME ELECTIVE
COURSE COURSE TITLE: AI TECHNIQUES

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Class work Marks: 25  
Total Marks: 100 marks  
Duration of Exam: 3 Hrs  
Credits: 3

COURSE OBJECTIVES: Students should be able to:
1. Understand the foundational aspects of ANN and their working.
2. Appreciate the fuzzy sets as distinct from classical sets; fuzzy logic & fuzzy Inferencing.
3. Understand the operators of Genetic Algorithm (GA); Distinguish Evolutionary Program (EP) & GA.
4. Identify Systems.

UNIT 1
Biological foundations of intelligent systems; Model of artificial neuron; Artificial Neural Networks; Single layer perceptron; Limitations of single layer perceptron; Multilayer Feed Forward NN; Least Mean Square (LMS) and Back-propagation training algorithm; Feedback networks; Radial Basis Function Networks.  
(12 hours)

UNIT 2
Fuzzy set; Operations on fuzzy sets; Fuzzy Logic, Knowledge Representation for fuzzy systems; Fuzzification; Fuzzy inference Mechanism; Defuzzification Methods; Mamdani v/s TSK fuzzy systems; Fuzzy Neural Networks, Application of Fuzzy Logic Controller (FLC) to power system  
(12 hours)

UNIT 3
Concept of system identification; Parameter estimators; Estimation through fuzzy modeling; System identification using fuzzy logic; System identification using neural network; Training data & Test data for ANN; Over-parametrization.  
(10 hours)

UNIT 4
Genetic algorithms (GAs); Real and integer coding / representation of parameters; Chromosome; Choice of initial population; Reproduction; Cross-over; Mutation; Implicit parallelism of GAs; Introduction to evolutionary program, Applications of genetic algorithm to practical problems.  
(11 hours)

TEXT BOOKS:

Reference:

COURSE OUTCOMES: Upon going through this course, students will be able to:
1. Learn the concepts of biological foundations of artificial neural networks
2. Learn Feedback networks and radial basis function networks and fuzzy logics
3. Carry out identification by fuzzy and neural network.
4. Acquire a working knowledge of GA & apply it to a practical problem.

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-II
Choice Based Credit System (Effective from Session 2018-19)

COURSE CODE: MPS584 C
COURSE TITLE: POWER SYSTEM PROTECTION LAB
CATEGORY: LAB1

L T P
- - 4

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Credits: 2

List of experiments:
1. To study the numerical IDMT over current relay. Obtain & plot its current-time characteristics for various plugs setting time multiplier & measure pickup / reset ratio.
2. To plot operating Characteristics of percentage numerical differential relay.
3. To plot operating Characteristics of numerical under voltage / over voltage relay.
4. To plot operating Characteristics of numerical Negative sequence relay.
5. To study C.T./PT testing by comparison method.
6. Instantaneous over current protection Relay based on Mann and Morrison algorithm.
7. Implementation of over current protection of transformer in LabVIEW.
8. MATLAB Program for Simulating Three Sample Algorithm.
9. Implementation Methods of Motor Protection in LabVIEW.

NOTES:-
1. Each Laboratory Class / Section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either be done by each student individually or in a group of not more than 3-4 students. Larger group be strictly discouraged/disallowed.
3. Pre-experimental & post-experimental quiz / questions may be offered for each Lab. experiment to reinforce and aid comprehension of the experiment.
M. Tech. in Electrical Engg. (PowerSystems), Semester-II
Choice Based Credit System (Effective from Session 2018-19)

Course Code: MPS586C
Course Title: ARTIFICIAL INTELLIGENCE LAB
Category: LAB2

L T P
- - 4

Class-work Marks: 25
Exam Marks: 75
Total Marks: 100
Duration of Exam: 3 Hrs.
Credits: 2

LIST OF EXPERIMENTS:

1. Write a program to simulate a perceptron network for pattern classification and function approximation.
2. Write a program to solve a XOR function using feed-forward neural network trained using back-propagation algorithm.
3. Write a program to implement adaptive noise cancellation using ADALINE neural network.
4. Given the region to be de-fuzzified, write programs to discuss the various methods that might be chosen.
5. Implementation of simple Over Current Relay using fuzzy logic.
6. Simulation and comparison of fuzzy PID controller with conventional PID controller for a given plant.
7. Solve optimal relay coordination as a linear programming problem using Genetic Algorithm.
8. Solve optimal relay coordination as a non-Linear programming problem using Genetic algorithm.
10. Write a program to simulate a perceptron network for pattern classification and function approximation.

NOTES:
1. At least 10 experiments are to be performed by students in the semester.
2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Department as per the scope of the syllabus and infrastructure available in the Institute.
Course Code: MPS601C  Category: Programme Elective Course

Course Title: Power System Transients

L  T  P
3  -  -

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam: 3 hours
Credits: 3

Course Objectives:
- Students will be able to:
  1. Learn the reasons for occurrence of transients in a power system
  2. Understand the change in parameters like voltage & frequency during transients
  3. To know about the lightning phenomenon and its effect on powersystem

UNIT 1

UNIT 2
Lightning, switching and temporary over voltages, Lightning, Physical phenomena of lightning, Interaction between lightning and power system, Influence of tower footing resistance and Earth Resistance, Switching: Short line or kilometric fault, Energizing transients - closing and re closing of lines, line dropping, load rejection – over voltages induced by faults

UNIT 3
Switching HVDC line Travelling waves on transmission line, Circuits with distributed Parameters Wave Equation, Reflection, Refraction, Behaviour of Travelling waves at the line Terminations, Lattice Diagrams – Attenuation and Distortion, Multi-conductor system and Velocity wave

UNIT 4
Insulation co-ordination: Principle of insulation co-ordination in Air, Insulated substation (AIS) and Gas Insulated Substation (GIS) Coordination between insulation and protection level, Statistical approach, Protective devices, Protection of system against over voltages, lightning arresters, substation earthing

Suggested reading

Course Outcomes:
- Students will be able to:
  1: Knowledge of various transients that could occur in power system and their mathematical formulation 2: Ability to design various protective devices in power system for protecting equipment and personnel 3: Coordinating the insulation of various equipments in power system 4: Modeling the power system for transient analysis.

Notes:
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-
III Choice Based Credit System (Effective from Session 2019-20)

COURSE CODE: MPS603C  CATEGORY: PROGRAMME ELECTIVE COURSE

COURSE TITLE: ELECTRIC POWER QUALITY

L  T  P
3  -  -

Class Work Marks: 25 marks
Exam Marks: 75 marks
Total Marks: 100 marks
Duration of Exam.: 3 hours
Credits: 3

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.
3. Understanding STATIC VAR Compensators.

UNIT 1

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. Dynamic Voltage Restorers for sag, swell and flicker problems. Grounding and wiring introduction, NEC grounding requirements-reasons for grounding typical grounding and wiring problems solutions to grounding and wiring problems

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. Static VAR compensators-SVC and STATCOM Active, three-phase three-wire and three-phase four wire systems,

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, Harmonic, Filtering-Shunt Injection, Filter for single phase, d-q domain control of three phase shunt active filters uninterruptible, power supplies constant voltage transformers, series active power filtering techniques for harmonic cancellation and isolation.

Suggested reading

Approved in the 13th meeting of Academic Council held on 18/06/2018.
Course Outcomes: -
Students will be able to:
1: Acquire knowledge about the harmonics, harmonic introducing devices and effect of harmonics on system equipment and loads
2: To develop analytical modeling skills needed for modeling and analysis of harmonics in Networks and components
3: To introduce the student to active power factor correction based on static VAR compensators and its control techniques
4: To introduce the student to series and shunt active power filtering techniques for harmonics.

Notes:-
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-III
Choice Based Credit System (Effective from Session 2019-20)

COURSE CODE: MPS605C  CATEGORY: PROGRAMME ELECTIVE COURSE

COURSE TITLE: INDUSTRIAL LOAD MODELING AND CONTROL

L T P  Class Work Marks: 25 marks
3 - -  Exam Marks: 75 marks
  - -  Total Marks: 100 marks
  - -  Duration of Exam.: 3 hours
  - -  Credits: 3

Course Objectives:- Students will be able to:
1. To understand the energy demand scenario
2. To understand the modeling of load and its ease to study load demand industrially
3. To know Electricity pricing models
4. Study Reactive power management in Industries

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

UNIT 2
Electricity pricing – Dynamic and spot pricing – Models, Direct load control - Interruptible load control, Bottom up approach - scheduling - Formulation of load Models, Optimization and control algorithms - Case studies

UNIT 3
Reactive power management in industries, controls - power quality impacts, application of filters Energy saving in industries, Cooling and heating loads, load profiling, Modeling - Cool storage, Types - Control strategies, Optimal operation, Problem formulation - Case studies

UNIT 4
Captive power units, Operating and control strategies, Power Pooling - Operation models, Energy banking, Industrial Cogeneration, Selection of Schemes Optimal Operating Strategies, Peak load saving, Constraints Problem formulation - Case study, Integrated Load management for Industries

Suggested reading
3. Y. Manichaikul and F.C. Schweppe ," Physically based Industrial load", IEEE Trans. on PAS,
6. IEEE Bronze Book- “Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities”, IEEE Inc, USA

Course Outcomes:
- Students will be able to:
1: Knowledge about load control techniques in industries and its application
2: Learn different types of industrial processes and optimize the process using tools like LINDO and LINGO
3: Apply load management to reduce demand of electricity during peak time.

Notes:
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-III
Choice Based Credit System (Effective from Session 2019-20)

COURSE CODE: MPS607C
COURSE TITLE: DYNAMICS OF LINEAR SYSTEMS

COURSE OBJECTIVES:
1. To give students an understanding of foundational concepts of dynamics of linear systems primarily based on State Space concept, rather than on Transfer Function. To impart a review of operations on matrices, followed by defining Fields & Vector Spaces, ‘State’ & related concepts.
2. To derive State Models of different types for a range of systems such as electrical, mechanical, hydraulic, electro-mechanical systems, etc.
3. To get an insight into solutions of state equations for continuous-time & discrete-time systems.
4. To understand controllability & observability concepts & apply tests thereof. To understand Lyapunov’s stability analysis tool for linear dynamical systems.

UNIT-I

STATE VARIABLE DESCRIPTIONS: The concept of State: initial state, definition of state, state vector, trajectory, Consistency conditions, State Transition Relation or State Equation; State equations for dynamic discrete-time system; Time invariance; Linearity; State model for linear systems, Non-uniqueness of State model; State diagrams for linear time-invariant continuous-time & discrete-time systems.

PHYSICAL SYSTEM & STATE ASSIGNMENT: Linear continuous time models of electrical, mechanical, hydraulic, electromechanical systems (illustrative problems). State variable representation using Phase variables, Observable Phase variable form, Controllable phase variable form, State space representation using Canonical variable or Normal form.

(12 hours)

UNIT-II

SOLUTION OF STATE EQUATIONS: Derivation of T.F. from State model; Diagonalization, Determination of diagonalized matrix, J and diagonalizing or Modal matrix, M; State equations for continuous time LTI system, Properties of STM (State Transition System) for LTI system; Computation of STM by Infinite series expansion, by Resolvent matrix method (Inverse Laplace Transform), by Similarity or Canonical transformation & by technique based on Cayley-Hamilton Theorem; Solution of state equations for discrete-time systems; Evaluation of STM for Discrete Time System; System Modes.

(12 hours)

UNIT-III

CONTROLLABILITY, OBSERVABILITY & STABILITY: Concept of controllability, Definition of controllability; General concept of observability, Definition of observability; Kalman tests for controllability & observability for Continuous-time system; Gilberts tests (Physical interpretation of Gilberts Tests) for controllability & observability; Lyapunov’s stability theory for linear dynamical systems.

(10 hours)


UNIT-IV

STATE VARIABLE TECHNIQUES: State variable representation of systems by various methods, Solution of state equations-state transition matrix. Transfer function from state variable model, Controllability & Observability of state variable model, Observer system.

TEXT BOOK:

REFERENCE BOOKS:

COURSE OUTCOMES:
After going through this course, the student shall be able to:
1. Have an understanding of State & related concepts, & carry out operations on matrices, & appreciate the axioms of Fields & Vector Spaces.
2. Derive State Models of different types of systems such as electrical, mechanical, hydraulic, electro-mechanical systems, etc.
3. Solve state equations for continuous-time & discrete-time systems.
4. Apply controllability & observability tests to different system models & to apply Lyapunov’s stability analysis tool for linear dynamical systems.

Notes:
1. The students in the examination will be allowed to use only non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including cellular phones are not allowed in the examination.
3. Examiner will set total eight questions in all, selecting two questions from each unit. Students are required to attempt five questions in all, selecting at least one from each unit.
MTOE651C: BUSINESS ANALYTICS
M. Tech. Semester – III (Common for all Branches)

L P Credits Class Work : 25 Marks
3 -- 3 Examination : 75 Marks
Total : 100 Marks
Duration of Examination : 3 Hours

Course Objectives:
The main objective of this course is to give the student a comprehensive understanding of business analytics methods
1. Understand the role of business analytics within an organization.
2. Business Analytics industry sequence is to familiarize the students with the concept of Data Analytics (Big Data) and its
   applicability in a business environment
3. Analyze data using statistical and data mining techniques and understand relationships between the underlying business
   processes of an organization.
4. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support
   managerial decision making.
5. To become familiar with processes needed to develop, report, and analyze business data.
6. Use decision-making tools/Operations research techniques.
7. Manage business process using analytical and management tools.
   Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports,
   pharmaceutical, aerospace etc

Course Outcomes:
1. At the end of the Fall semester, students should have acquired an understanding of Analytics – the terminology, concepts
   and familiarity of potential tools and solutions that exist today Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics
3. Students will demonstrate the ability to use technical skills in predictive and prescriptive modeling to support business
   decision-making
4. Students will demonstrate the ability to translate data into clear, actionable insights. student should be better familiar with
   overall analytics tools/techniques and their use in corporate

Syllabus contents:

UNIT I: 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.

UNIT II: 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.

UNIT III: 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.

UNIT IV: Decision Analysis: Formulating Decision Problems, Decision Strategies, with the without Outcome Probabilities,
   Decision Trees, the Value of Information, Utility and Decision Making.
   Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting
   Models for Stationary Time.

TEXT / REFERENCE BOOKS:
1. Project Management: The Managerial Process by Erik Larson and, Clifford Gray
2. Business Analysis by James Cadle et al.
4. Whigham David, Business Data Analysis, Oxford University, Press, Delhi.
5. Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie or Die. Eric Siegel.

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
Approved in the 13th meeting of Academic Council held on 18/06/2018.
MTOE655C: OPERATIONS RESEARCH
M. Tech. Semester – III (Common for all Branches)

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<td>25Marks</td>
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**Course Objectives:**
1. To develop modeling skills in students.
2. To develop skill in students for efficient designing analysis and control of complete system.
3. To make students capable of formulating the practical problems into mathematical problems.
4. To acquaint student with linear as well as non-linear programming problem and their application.

**Course Outcomes:**
1. Students will be able to apply the dynamic programming to solve problems of discrete and continuous variables.
2. Students will be able to carry out sensitivity analysis.
3. Student will be able to model the real world problem and simulate it.
4. The students will be able to carry forward the operation research techniques in practical problems.

**Syllabus contents:**


**UNIT II:** Non liner programming: NLPP Mathematical formulation and solution with equally constraints, Lagrange’s method, Graphical method, Kuhn—Tucker necessary & sufficient conditions for the optimality of objective function in GNLP problem. Dynamic programming: Kuhn –Tucker condition’s, Wolfe’s and Bcale’s method.

**UNIT III:** Deterministic inventory control models: Meaning & function role of inventory control, reason for carrying inventory, single item inventory control model with & without shortages. Probabilistic inventory control models: Inventory control models without set up cost and with set up cost.

**UNIT IV:** Project management; PERT and CPM, Basic difference between PERT & CPM, Phases up project management PERT /CPM network component & precedence relationships, critical path analyses, projects scheduling with uncertain activity times, project time –cost trade-off. Sequencing problem: Processing an jobs through two machines, three machines and through m-machines. Theory of games: Two- person zero –sum games, pure strategies (with saddle points) mixed strategies (without saddle point), algebraic method only.

**TEXT / REFERENCE BOOKS:**
2. H.M.Wanger, Principles of Operation Research PHI, Delhi, 1982

**NOTE:**
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
MTOE657C: COST MANAGEMENT OF ENGINEERING PROJECTS
M. Tech. Semester – III (Common for all Branches)

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Course Objectives:

Course Outcomes:

Syllabus contents:

UNIT I: INTRODUCTION AND OVERVIEW

Chapter 1 Introduction, basic economic concepts, interest formulae, present worth, rate of return, Elements of financial accounting: depreciation, taxes and their impact in economic studies

Chapter 2 Cost concepts in decision making; elements of cost, relevant cost, overheads, differential cost, incremental cost and opportunity cost, objectives of a costing system, inventory valuation, creation of a data base for operational control, provision of data for decision making.

UNIT II: PROJECT

Chapter 3 Meaning, different types, why to manage, cost overrun centres, various stages of project execution, concept 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.

Chapter 4 Importance Project site: Data required with significance. Project contracts. Types and contents. Project cost control. Bar charts and network diagram. Project commissioning: Mechanical and process. Project appraisal and selection, recent trends in project management

UNIT III: ECONOMIC ANALYSIS FOR ENGINEERING PROJECTS

Chapter 5 Cost behavior and profit planning. Marginal costing, distinction between marginal costing and absorption costing. Break even analysis, cost volume profit relationship, various decision making problems. Standard costing and variance analysis, pricing strategies Pareto analysis, Target analysis, life cycle costing, Costing of service sector.

Chapter 6 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, value chain analysis, Budgetory control, Flexible budget, Performane budget, Zero based budget, Measurement of divisional profitability pricing decisions including transfer pricing.

UNIT IV: QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT

Chapter 7 PERT CPM; Activity networks, basic PERT/CPM calculations, Planning and scheduling of activity networks, Assumptions in PERT modeling, time cost tradeoffs, PERT/ cost accounting, Scheduling with limited resources, Generalized activity networks GERT, Prospects of PERT/CPM

Chapter 8 Linear programming, Transportation problems, Assignment problems, Simulation, Learning curve theory.

TEXT / REFERENCE BOOKS:

1. Cost Accounting: A Managerial Emphasis
   - Charles T. Horngren
   - Srikanth M. Datar
   - Madhav V. Rajan
   - Pearson Edu.

2. Fundamentals of Financial Management
   - Prasanna Chandra
   - Tata McGraw Hill

3. Quantitative Techniques in Management
   - N D Vohra
   - Tata McGraw Hill

4. Foundation Engineering Handbook
   - Winterkorn, Hans
   - Chapman & Hall London.

5. Principles and Practice of cost accounting
   - Ashish K Bhattacharya
   - A H Wheeler

6. Principles of engineering economy
   - E L Grant et al.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
MTOE659C: COMPOSITE MATERIALS
M. Tech. Semester – III (Common for all Branches)

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<td>: 25Marks</td>
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<td>: 3 Hours</td>
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Course Objectives:

Course Outcomes:

Syllabus contents:


UNIT IV: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT / REFERENCE BOOKS:

NOTE:
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.

Approved in the 13th meeting of Academic Council held on 18/06/2018.
MTOE661C: WASTE TO ENERGY
M. Tech. Semester – III (Common for all Branches)

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Course Objectives:
To give an idea about different biomass and other solid waste materials as energy source and their processing and utilization for recovery of energy and other valuable products. A comprehensive knowledge of how wastes are utilized for recovery of value would be immensely useful for the students from all fields.

Course Outcomes:
In these days of energy crisis and environmental deterioration, students will understand the concept of energy by waste products. It is being used globally to generate electricity and provide industrial and domestic applications. Students will also enable to understand the environmental issues related to harnessing and utilization of various sources of energy and related environmental degradation.

Syllabus contents:


UNIT II: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste, MSW

UNIT III: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, Direct combustion, Types of biogas Plants, Applications.


TEXT / REFERENCE BOOKS:

NOTE:  
1. In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
3. Electronics gadgets including Cellular phones are not allowed in the examination.
Course Code: MPS609C  
Course Title: MINI PROJECT

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The objective of mini project is to develop in students the professional quality of synthesis employing technical knowledge obtained in the field of Engineering & Technology through a project work involving design / analysis augmented with creativity, innovation and ingenuity.

The student shall take up investigative study on a topic in the broad relevant field of engineering, involving hardware or software or both hardware & software, to be assigned by the department on an individual basis, under the guidance of a supervisor from the department. This is expected to provide a good initiation for the student(s) in R&D work.

The activities under mini project may normally include:
1. Literature survey on an assigned topic.
2. Working out a preliminary approach to the problem relating to the assigned topic.
4. Compilation of the work and presenting it in two seminar talks in the semester, before a committee having M.Tech. coordinator and supervisor(s).
5. Submit a written spiral-bound report on the work undertaken to the M.Tech. Coordinator.

Internal evaluation of Mini Project will be done at the end of the semester through a seminar by the committee consisting of the following:
1. Chairperson/Head of Department/ Nominee: Chairperson
2. M. Tech. Coordinator: Member-Secretary
3. Respective Project Supervisor(s): Member(s)

Final exam. will be conducted by the internal examiner (M. Tech. Coordinator / faculty nominated by Chairperson) and external examiner to be appointed by Controller of Examinations from a Panel of Examiners submitted by the Dept.

M. Tech. coordinator will be assigned a load of 1 hour per week excluding his/ her own guiding load. Project supervisor (guiding teacher) will be assigned a load of 1 hour per week per student subject to a maximum load of 2 hours.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-III
Choice Based Credit System (Effective from Session 2019-20)

Course Code: MPS611C

Course Title: DISSERTATION (PHASE-I)

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The objective of this course is to develop in students the capacity for analysis & judgment and the ability to carry out independent investigation in design/development through a dissertation work involving creativity, innovation and ingenuity. The work should start with comprehensive literature search and critical appreciation thereof so as to select a research problem and finalize the topic of dissertation.

Each student will carry out an independent dissertation under the supervision of a supervisor; in no case, more than two supervisors may be associated with one dissertation work. The first supervisor must be from the department, however, for interdisciplinary research work, the second supervisor may be from other department of the university/ outside university/industry. In the latter case, consent of the second supervisor with justification thereof needs to be submitted to the dissertation coordinator.

The Dissertation (Phase-I) involving literature survey and problem formulation along with data collection (if required) commences in 3rd semester & will be completed as Dissertation (Phase-II) in 4th semester. Each student will be required to present two seminar talks, first towards the beginning of the Dissertation (Phase-I) to present the scope of the work and to finalize the topic, and the second towards the end of the semester, presenting the progress report containing literature survey, partial results (if any) of the work carried out by him/her in the semester. The student will be required to submit one copy of spiral-bound progress report to the M. Tech. Coordinator.

Internal evaluation of Dissertation (Phase-I) will be done by following committee:
1. Chairperson / Head of Department / Nominee : Chairperson
2. M. Tech. Coordinator/Senior Faculty : Member-Secretary
3. Respective Dissertation Supervisor(s) : Member(s)

Final exam will be conducted by the internal examiner (M. Tech. Coordinator/ faculty nominated by Chairperson) & an external examiner to be appointed by Controller of Examinations from a panel of examiners submitted by the Dept.

For this course, M. Tech. coordinator will be assigned a load of 1 hour per week excluding his/ her own guiding load. Dissertation supervisor (guiding teacher) will be assigned a load of 1 hour per week for the first student and additional 1 hour per week (for their own department only) for the subsequent student(s) subject to a maximum load of 2 hours. Work load allocated for the joint supervision within the department will be treated as half for each supervisor.
M. TECH. ELECTRICAL ENGINEERING (POWER SYSTEMS) SEMESTER-IV
Choice Based Credit System (Effective from Session 2019-20)

MPS602C DISSERTATION (PHASE-II)

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The Dissertation (Phase-II) shall be the extension of Dissertation (Phase-I) carried out in 3rd semester. Each student will be required to present three seminar talks, first at the beginning of the semester to present the progress made during the winter break; second in the middle of the semester involving partial results obtained and comparative analysis; and third towards the end of the semester, presenting the dissertation report of the work carried out. Each student will be required to submit two copies of dissertation report to M. Tech. coordinator. The committee constituted by the Chairperson of the department will screen all the presentations so as to award the sessional marks.

**INTERNAL ASSESSMENT:**
The internal assessment (Class-work evaluation) will be effected through presentation and discussion thereon by the following committee:

1. Chairperson/Head of Department / Nominee : Chairperson
2. M. Tech. Coordinator/Senior Faculty : Member-Secretary
3. Respective Dissertation Supervisor(s) : Member(s)

**EXTERNAL ASSESSMENT:**
Dissertation will be evaluated by the following committee:

1. Chairperson/Head of the Department / Nominee : Chairperson
2. Respective Dissertation Supervisor(s) : Member(s)
3. External Expert : To be appointed by the University.

For this course, supervisor(s) will be assigned a load of 2hours per week for the first student and additional 1 hour per week for the subsequent student(s) subject to a maximum load of 3 hours. Work load allocated for the joint supervision within the department will be treated as half for each supervisor.

**NOTE:** There is a desirable requirement of one publication in a UGC-listed journal / unpaid journal. The external expert must be from the respective area of the specialization. Chairperson & M. Tech. Coordinator in mutual consultation will divide the submitted dissertations into groups depending upon area of specialization and recommend the list of experts for each group separately to the Vice-Chancellor for selecting the examiners (one examiner for not more than four students of a group).