SCHEME OF STUDIES AND EXAMINATIONS
FOR
MASTER OF TECHNOLOGY
IN
ELECTRICAL & ELECTRONICS ENGINEERING

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATIONS FOR MASTER OF TECHNOLOGY IN ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER-I

S.No.	Course Code	Course Title	Teaching schedule			Class Work	Examination		Total
							Theory	Practical	
1	MTEPS101	Microprocessors & Microcontroller	3	1	0	50	100	-	150
2	MTEPS102	HVDC Transmission	3	1	0	50	100	-	150
3	MTEPS103	Power System Operation and Control	3	1	0	50	100	-	150
4	MTEPS104	Reactive Power Compensation & Management	3	1	0	50	100	-	150
5	MTEPS105	Elective – I	3	1	0	50	100	-	150
6	MTEPS106	Power Systems Laboratory	0	0	2	50	-	50	100
		Grand Total	15	5	2	300	500	50	850

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering entire syllabus. However the examiner shall evaluate the performance of the student in the theory paper finally by assigning one of the grades out of A^+ , A,B,C,D & E. The examination of practical courses shall also be evaluated on the basis of these grades.
2. The sessionals of theory and practical courses shall also be evaluated in the basis of these grades.
3. The choice of student for any elective shall not be binding on the department to offer it.
4. The grading system is define at the end of scheme of studies & examinations and will be supplied by the University to the examiner(s).

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATIONS FOR MASTER OF TECHNOLOGY IN ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER-II

S.No.	Course Code	Course Title	Teaching schedule			Class Work	Examination		Total
							Theory	Practical	
1	MTEPS201	Power System Dynamics and Stability	3	1	0	50	100	-	150
2	MTEPS202	FACTS Controllers	3	1	0	50	100	-	150
3	MTEPS203	Real Time Control of Power Systems	3	1	0	50	100	-	150
4	MTEPS204	Advanced Power System Protection	3	1	0	50	100	-	150
5	MTEPS205	Elective – II	3	1	0	50	100	-	150
6	MTEPS206	Simulation Laboratory	0	0	2	50	-	50	100
		Grand Total	15	5	2	300	500	50	850

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering entire syllabus. However the examiner shall evaluate the performance of the student in the theory paper finally by assigning one of the grades out of A^+ , A,B,C,D & E. The examination of practical courses shall also be evaluated on the basis of these grades.
2. The sessionals of theory and practical courses shall also be evaluated in the basis of these grades.
3. The choice of student for any elective shall not be binding on the department to offer it.
4. The grading system is define at the end of scheme of studies & examinations and will be supplied by the University to the examiner(s).

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATIONS FOR MASTER OF TECHNOLOGY IN ELECTRICAL & ELECTRONICS ENGINEERING

LIST OF ELECTIVES

S.No.	Course Code	Course Title	Teaching Schedule			Class Work	Examination		Total
			L	T	P		Theory	Practical	
ELECTIVE-I									
1	MTEPS105(i)	Electrical distribution System	3	1	0	50	100	-	150
2	MTEPS105(ii)	EHVAC Transmission	3	1	0	50	100	-	150
3	MTEPS105(iii)	Power Quality	3	1	0	50	100	-	150
ELECTIVE-II									
1	MTEPS205(i)	Artificial Intelligence Techniques	3	1	0	50	100		150
2	MTEPS205(ii)	Advanced DSP	3	1	0	50	100		150

*Student has to take one subject out of subjects offered by department from this list.

NOTE:

1. The paper setter shall set each theory paper of 100 marks covering entire syllabus. However the examiner shall evaluate the performance of the student in the theory paper finally by assigning one of the grades out of A^+ , A,B,C,D & E. The examination of practical courses shall also be evaluated on the basis of these grades.
2. The sessionals of theory , practical , Seminar and Dissertation courses shall also be evaluated in the basis of these grades.
3. The choice of student for any elective shall not be binding on the department to offer it.
4. The grading system is define at the end of scheme of studies & examinations and will be supplied by the University to the examiner(s).

M.D UNIVERSITY, ROHTAK

SCHEME OF STUDIES & EXAMINATIONS FOR

MASTER OF TECHNOLOGY IN

Electrical & Electronics Engineering

The Performance of the student of M.Tech EEE Course shall be graded on the basis of percentage of marks and corresponding grades as mentioned below:

A)

Marks		Grades		
Marks				
85	≤	A^+	≤	100
75	≤	A	<	85
60	≤	B	<	75
50	≤	C	<	60
40	≤	D	<	50
00	≤	E	<	40

Letter Grades	Performance	Division
A^+	Excellent	First
A	Very Good	First
B	Good	First
C	Fair	Second
D	Pass	Third
E	Repeat	Fail

Note: The candidate who have passed all the semesters examination in the first attempt obtaining at least 75% marks in aggregate shall be declared to have passed in the first division with Distinction in the degree.

B)

Actual percentage of Marks Obtained and Corresponding grades should be mention on detailed marks certificate of student. To obtain "D" grade a student must have secure at least 40% marks in each subject of the semester Examinations.

C)

Students who earned an "E" grade or less than 40% marks in any subject shall Have re appear in that subject.

SEMSTER-I

MTEPS101 MICROPROCESSORS & MICRO CONTROLLERS

L-T-P Team Work Marks: 50

3-1-0 Theory paper Marks: 100

Total Marks:150

Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit-I: Register Organization of 8086, Architecture, Signal description of 8086, Physical memory Organization, and addressing modes of 8086.

Unit-II: 8086/8088 instruction set and assembler directives, machine language instruction formats.

Unit-III: General Bus Operation, minimum mode 8086 system and timings, maximum mode 8086 system mode and timings

Unit–IV: Fundamental I/O considerations, Programmed I/O, Interrupt I/O, Block transfers and DMA.

Unit-V: Introduction to stack, stack structure of 8086/8088, Interrupts and Interrupt service routine, interrupt cycle of 8086/8088.

Unit-VI: Interfacing ROM, RAM and I/O ports to Micro Computer System, PPI (Programmable Peripheral Interface), 8255 modes of operation, Interfacing A to D converters, Interfacing D to A converters, Interfacing Pirnciples and stepper motor interfacing.

Unit-VII :Programmable Interval timer 8254, Programmable Interrupt Controller 8259A, Key Board or Display Controller 8279, Programmable Communication Interface 8251 USART.

Unit-VIII: Introduction to 8051/31 Micro Controller, PIN diagram, architecture, Different modes of Operation of timer/counters, addressing modes of 8051 and instruction set.

REFERENCE BOOKS

1. Microprocessors and Interfacing: Programming and Hardware by Douglas V. Hall, 2nd edition, TMH, New Delhi, 1999.
2. Micro Computer Systems : The 8086/8088 family by YU-CHENG LIU, GLENN A. GIBSON, 2nd edition, PHI India, 2000.
3. The 8051Microcontrollers: Architecture, Programming & Applications by Kenneth J Ayala, Second Edition, Penram International Publishing (India).
4. Advanced Microprocessors and Peripherals, Architecture Programmingand Interfacing by A.K. Ray & K.M. Bhurchandi, Forth reprint 2004, TMH.
5. The 8051 Microcontroller and Embedded Systems – Mohammad Ali Mazdi, Janice GillispieMazidi, Pearson Education (Singapore) Pvt. Ltd., 2003.

MTEPS102 H.V.D.C. TRANSMISSION

L-T-P
3-1-0

Team Work Marks: 50
Theory paper Marks: 100
Total Marks:150
Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 :H.V.D.C. Transmission : General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration.
Unit 2 : Static Power Converters : 3-pulse, 6-pulse and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter – special features of converter transformers.
Unit 3 : Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters.
Unit 4 : Control of HVDC Converters and systems : constant current, constant extinction angle and constant Ignition angle control. Individual phase control and equidistant firing angle control, DC power flow control.
Unit 5 : Interaction between HV AC and DC systems – Voltage interaction, Harmonic instability problems and DC power modulation.
Unit 6 : Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control.
Unit 7 : Transient over voltages in HV DC systems : Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults
Unit 8:Converter faults and protection in HVDC Systems: Converter faults, over current protection - valve group, and DC line protection, circuit breakers. Over voltage protection of converters, surge arresters.

REFERENCE BOOKS

1. K.R.Padiyar : High Voltage Direct current Transmission, Wiley Eastern Ltd., New Delhi – 1992.
2. E.W. Kimbark : Direct current Transmission, Wiley Inter Science – New York.
3. J.Arillaga : H.V.D.C.Transmission Peter Peregrinus ltd., London UK 1983
4. E.Uhlman : Power Transmission by Direct Current, Springer Verlag, Berlin Helberg – 1985.

MTEPS103 POWER SYSTEM OPERATION AND CONTROL

L-T-P
3-1-0

Team Work Marks: 50
Theory paper Marks: 100
Total Marks:150
Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 : Unit commitment problem : Introductions to UCP, thermal & Hydral constraints in Unit commitment : Priority list scheme method, unit commitment problem solution by priority list scheme method,

Unit 2 : Unit commitment problem solutions by Dynamic programming Approach. Introduction, advantages of DP method over priority list scheme, Back word DP approach, forward DP approach algorithm and their flow charts solution UCP using Dynamic program method.

Unit 3 : Load Frequency Control-I : Necessity of keeping frequency constant. Definition of control area, single area control, Block diagram representation of an isolated Power System, Steady State analysis, Dynamic response-Uncontrolled case.

Unit 4 : Proportional plus Integral control of single area and its block diagram representation, steady state response, load frequency control and Economic dispatch control.

Unit 5 : Load Frequency Control-II : Load frequency control of 2-area system : uncontrolled case and controlled case, tie-time bias control.

Unit 6 : Optimal LF control-steady state representation, performance Index and optimal parameter adjustment.

Unit 7 : Generation with limited Energy supply : Take-or-pay fuel supply contract, composite generation production cost function. Solution by gradient search techniques, Hard limits and slack variables, Fuel scheduling by linear programming.

Unit 8 : Interchange Evaluation and Power Pools Economy Interchange, Economy interchange Evaluation, Interchange Evaluation with unit commitment, Multiple Interchange contracts. After-the-fact production costing, Transmission Losses in transaction Evaluation, other types of Interchange, power pools.

REFERENCE BOOKS

1. Electrical Energy Systems Theory - by O.I.Elgerd, Tata McGraw-Hill Publishing Company Ltd, 2nd edition.
2. Power System Analysis by HadiSaadat – Tata McGraw Hill Publications
3. Power Generation, Operation and Control - by A.J.Wood and B.F.Wollenberg,Johnwiley& sons Inc. 1984.
4. Modern Power System Analysis - by I.J.Nagrath&D.P.Kothari, Tata McGraw-Hill Publishing Company ltd, 2nd edition.

MTEPS104 REACTIVE POWER COMPENSATION AND MANAGEMENT

L-T-P Team Work Marks: 50

3-1-0 Theory paper Marks: 100

Total Marks:150

Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit I:Load Compensation

Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing – Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads- examples.

Unit II: Steady – state reactive power compensation in transmission system:

Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation – examples

Unit III:Transient state reactive power compensation in transmission systems:

Characteristic time periods – passive shunt compensation – static compensations- series capacitor compensation –compensation using synchronous condensers – examples

Unit -IV:Reactive power coordination:

Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of power supply – disturbances- steady –state variations – effects of under voltages – frequency – Harmonics, radio frequency and electromagnetic interferences

Unit -V:Demand side management:

Load patterns – basic methods load shaping – power tariffs- KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels

Unit -VI:Distribution side Reactive power Management:

System losses –loss reduction methods – examples – Reactive power planning – objectives – Economics Planning capacitor placement – retrofitting of capacitor banks

Unit -VII:User side reactive power management:

KVAR requirements for domestic appliances – Purpose of using capacitors – selection of capacitors – deciding factors – types of available capacitor, characteristics and Limitations

Unit -VIII: Reactive power management in electric traction systems and are furnaces:

Typical layout of traction systems – reactive power control requirements – distribution transformers- Electric arc furnaces – basic operations- furnaces transformer –filter requirements – remedial measures –power factor of an arc furnace

REFERENCE BOOKS

1. Reactive power control in Electric power systems by T.J.E.Miller, John Wiley and sons, 1982 (Units I to IV)
2. Reactive power Management by D.M.Tagare, Tata McGraw Hill, 2004.(Units V toVIII)

MTEPS105(i) ELECTRICAL DISTRIBUTION SYSTEMS (ELECTIVE-I)

L-T-P Team Work Marks: 50

3-1-0 Theory paper Marks: 100

Total Marks:150

Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 : General : Introduction to Distribution systems, an overview of the role of computers in distribution system planning-Load modeling and characteristics: definition of basic terms like demand factor, utilization factor, load factor, plant factor, diversity factor, coincidence factor, contribution factor and loss factor-Relationship between the load factor and loss factor - Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.

Unit 2: Distribution Feeders and Substations : Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, feeder-loading.

Unit 3 : Design practice of the secondary distribution system.

Location of Substations : Rating of a Distribution Substation, service area with primary feeders. Benefits derived through optimal location of substations.

Unit 4 : System analysis : Voltage drop and power loss calculations : Derivation for volt-drop and power loss in lines, manual methods of solution for radial networks, three-phase balanced primary lines, non-three-phase primary lines.

Unit 5 : Protective devices and coordination : Objectives of distribution system protection, types of common faults and procedure for fault calculation.

Unit 6 : Protective Devices: Principle of operation of fuses, circuit reclosers, line sectionalizer and circuit breakers. Coordination of protective devices : General coordination procedure.

Unit 7 : Capacitive compensation for power factor control: Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched) power factor correction, capacitor location. Economic justification.Procedure to determine the best capacitor location.

Unit 8 : Voltage control : Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

REFERENCE BOOKS

1. Electric Power Distribution System Engineering by Turan Gonen, Mc.Graw-Hill Book Company,1986.
2. Electric Power Distribution-by A.S. Pabla, Tata McGraw-Hill Publishing Company, 4th edition, 1997.

MTEPS105(ii) EHVAC TRANSMISSION (ELECTIVE-I)

L-T-P
3-1-0

Team Work Marks: 50
Theory paper Marks: 100
Total Marks:150
Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 :E.H.V. A.C. Transmission , line trends and preliminary aspects ,standard transmission voltages – power handling capacities and line losses – mechanical aspects.

Unit 2 :Calculation of line resistance and inductance : resistance of conductors, temperature rise of conductor and current carrying capacity. Properties of bundled conductors and geometric mean radius of bundle, inductance of two conductor lines and multi conductor lines, Maxwell's coefficient matrix.

Unit 3 : Line capacitance calculation : capacitance of two conductor line, and capacitance of multi conductor lines, potential coefficients for bundled conductor lines, sequence inductances and capacitances and diagonalization.

Unit 4 :Calculation of electro static field of AC lines - Effect of high electrostatic field on biological organisms and human beings.

Unit 5 : Surface voltage Gradient on conductors, surface gradient on two conductor bundle and cosine law, maximum surface voltage gradient of bundle with more than 3 sub conductors, Mangolt formula.

Unit 6 : Corona : Corona in EHV lines – corona loss formulae – attenuation of traveling waves due to corona – Audio noise due to corona, its generation, characteristics and limits, measurement of audio noise.

Unit 7 : Power Frequency voltage control : Problems at power frequency, generalized constants, No load voltage conditions and charging currents, voltage control using synchronous condenser, cascade connection of components : Shunt and series compensation, sub synchronous resonance in series – capacitor compensated lines

Unit 8 :Static reactive compensating systems : Introduction, SVC schemes, Harmonics injected into network by TCR, design of filters for suppressing harmonics injected into the system.

REFERENCE BOOKS

1. Extra High Voltage AC Transmission Engineering – Rakosh Das Begamudre, Wiley Eastem ltd., New Delhi – 1987.
2. EHV Transmission line reference book – Edision Electric Institute (GEC) 1986.

MTEPS105(iii) POWER QUALITY (ELECTIVE-I)

L-T-P
3-1-0

Team Work Marks: 50
Theory paper Marks: 100
Total Marks:150
Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 :Power and Voltage Quality : General, classes of Power Quality Problems, Power quality terms, Power frequency variations, the power quality evaluation procedure.

Unit 2 : Voltage quality : Transients, long and short duration Voltage variations, Voltage imbalance, waveform distortion, Voltage Flicker.

Unit 3:Voltage sags and Interruptions :Sources of sags and Interruptions. Estimating Voltage sag performance.

Unit 4 : Fundamental Principles of Protection. Solutions at the end-user level. Evaluating Ride-through Alternatives. Motor-Starting Sags.

Unit 5 : Fundamentals of Harmonics : Harmonic distortion. Voltage versus Current distortion.Harmonic indexes.Harmonic sources from commercial loads.Harmonic sources from industrial loads.Locating Harmonic sources.System response characteristics.Effects of Harmonic Distortion.

Unit 6 : Distributed Generation and Power Quality : Resurgence of DG. DG Technologies. Interface to the Utility System. Power Quality Issues.Operating Conflicts. DG on distribution Networks . Siting DG distributed Generation, Interconnection standards.

Unit 7 :Wiring and Grounding : Resourses, Definitions, Reasons for Grounding, Typical wiring and grounding problems, Solution to wiring and grounding problems.

Unit 8 : Power Quality Monitoring : Monitoring Consideration. Historical Perspective of power quality measurement equipment. Assessment of Power Quality.

REFERENCE BOOKS

1. Electrical Power Systems Quality : By ROGER C. DUGAN, Electrotek Concepts Inc. (second edition)

MTEPS106 POWER SYSTEM LABORATORY

L-T-P
3-1-0

Team Work Marks: 50
Practical Marks: 50
Total Marks:100
Exam. Duration: 3 Hrs.

1. Determination of Sub-Transient Reactance of a Salient Pole Machine.
2. Determination of Sequence Impedances of a Cylindrical Rotor Synchronous Machine.
3. Fault Analysis of
   i) LG Fault
   ii) LL Fault
   iii) LLG Fault
   iv) LLLG Fault
4. Power Angle Characteristics of a Salient Pole Synchronous Machine.
5. Equivalent Circuit of a Three Winding Transformer.
6. Characteristics of IDMT Over Current Relay (Electro Magnetic Type).
7. Characteristics of Static Negative Sequence Relay.
8. Characteristics of Over Voltage Relay.
   i) Electromagnetic Type
   ii) Microprocessor Type
9. Characteristics of Percentage Biased Differential Relay.
   i) Electromagnetic Type
   ii) Static Type
10. Simulation of 220KV Transmission line model.
    i) Ferranti Effect
    ii) Transmission line parameter
    iii) Surge Impedance loadings
    iv) Voltage control methods
11. Transformer Oil Testing.

SEMSTER-II

MTEPS201 POWER SYSTEM DYNAMICS & STABILITY

L-T-P Team Work Marks: 50

3-1-0 Theory paper Marks: 100

Total Marks:150

Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 : Introduction Basic Concepts, Definitions and Classification of Power System Stability

Unit 2 : Voltage stability: Basic concepts related to voltage stability, voltage collapse, voltage stability analysis – static and dynamic analysis, the continuation power flow analysis, prevention of voltage collapse.

Unit 3 : Transient stability: Equal area criterion, numerical integration methods, simulation of power system dynamic response, direct methods of transient stability analysis – description of transient energy function approach, limitations of the direct methods. Methods of improving transient stability.

Unit 4 : Synchronous machine modeling for stability studies: Basic equations of a synchronous machine, the dq0 transformation, per unit representation, equivalent circuits for direct and quadrature axes, steady state analysis, transient performance, magnetic saturation`, equations of motion, swing equation, simplified model with ammortisseurs neglected, constant flux linkage model.

Unit 5: Excitation Systems : Rotating Self-excited Exciter with direct acting Rheostatic type, voltage regulator – Rotating main and Pilot Exciters with Indirect Acting Rheostatic Type Voltage Regulator.

Unit 6 : Rotating Main Exciter, Rotating Amplifier and Static Voltage Regulator – Static excitation scheme – Brushless excitation system

Unit 7 : Effect of governor action and exciter on power system stability. Effect of saturation, saliency & automatic voltage regulators on stability..

Unit 8 : Digital simulation of transient stability: Swing equation, Machine equation..

REFERENCE BOOKS

1. Power System Stability by Kimbark Vol. I&II, III – 1968, Dover Publication Inc, New York 1968.
2. Power System control and stability by Anderson and Fund, Vol – I, P.M.Arolerson&A.A.fouad, Galgotia Publications 3B/12, UttarimargRajunder Nagar, New Delhi – 110060, 1981, 1 st edition.
3. Power System Dynamics Stability and Control by K.R.Padiyar, Second edition B.S.Publications 2002.
4. Computer Applications to Power Systems–Glenn.W.Stagg&Ahmed. H.El.Abiad
5. Power Systems Analysis & Stability – S.S.VadheraKhanna Publishers.
6. Power System Analysis by "HadiSaadat" – Tata McGraw Hill Publications
7. Power System Analysis by John J.Graniger William D.Stevenson. JR. – Tata McGraw Hill Publications.

MTEPS202 FACTS CONTROLLERS

L-T-P
3-1-0

Team Work Marks: 50
Theory paper Marks: 100
Total Marks:150
Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 :. Reactive Power Control in Electric Transmission Systems, Loading Capability and Stability Considerations. Introduction to acts, related concepts and system requirements.

Unit 2 : Opportunities for FACTS, basic types of FACTS controllers, benefits from FACTS controllers, Requirements and Characteristics of High Power devices – Voltage and Current rating, losses and speed of switching, parameter trade-off of devices.

Unit 3 : Transformer connections for 12 pulse, 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source converters, comparison of current source converters with voltage source converters.

Unit 4 : Objectives of shunt compensation, mid point voltage regulation for line segmentation, End of line voltage support to prevent voltage instability, improvement of transient stability, Power oscillation damping.

Unit 5 : Static series compensators : Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, functional requirements. GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC), control schemes for GSC, TSSC and TCSC.

Unit 6: series compensators like CSE, TCSC, SSSC, combined compensators (UPFC) and phase shifters devices such as SPS, TCPAR.

Unit 7 : Methods of controllable var generation: variable impedance type static var generators – TCR and TSR, TSC, FC-TCR, TSC-TCR, switching converter type var generators, hybrid var generators.

Unit 8 : SVC and STATCOM : The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping, operating point control and summary of compensation control,SMES.

REFERENCE BOOKS

1. Understanding FACTS,N.G.Hingorani and L.Guygi, IEEE Press, Standard Publications, 2001.
2. Flexible a c transmission system (FACTS), Edited by YONG HUE SONG and ALLAN T JOHNS, Institution of Electrical Engineers, London.

MTEPS203 REAL TIME CONTROL OF POWER SYSTEM

L-T-P
3-1-0

Team Work Marks: 50
Theory paper Marks: 100
Total Marks:150
Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 : State Estimation : Different types of State Estimations, Theory of WLS state estimation, sequential and non-sequential methods to process measurements.
Unit 2 : Bad data Observability, Bad data detection, identification and elimination.
Unit 3 : Security and Contingency Evaluation : Security concept, Security Analysis and monitoring, Contingency Analysis for Generator and line outages by iterative linear power flow method, Fast Decoupled model, and network sensitivity methods.
Unit 4 : Computer Control of Power Systems : Need for real time and computer control of power systems, operating states of a power system,
Unit 5 : SCADA - Supervisory control and Data Acquisition systems implementation considerations, energy control centres, software requirements for implementing the above functions.
Unit 6 : Voltage Stability : What is voltage stability, voltage collaMTEPSe, and voltage security, relation of voltage stability to rotor angle stability.
Unit 7 : Voltage stability analysis Introduction to voltage stability analysis `P-V' curves and `Q-V' curves, voltage stability in mature power systems, long-term voltage stability, power flow analysis for voltage stability, voltage stability static indices and Research Areas
Unit 8 : Application of AI and ANN in Power System : Basic concepts and definitions, algorithms for load flow, short term load forecasting, fault diagnosis and state estimation.

REFERENCE BOOKS

1. John J.Grainger and William D.Stevenson, Jr. : Power System Analysis, McGraw-Hill, 1994, International Edition.
2. Allen J.Wood and Bruce F.Wollenberg : Power Generation operation and control, John Wiley & Sons, 1984.
3. R.N.Dhar : Computer Aided Power Systems Operation and Analysis, Tata McGraw Hill, 1982
4. L.P.Singh : Advanced Power System Analysis and Dynamics, Wiley Eastern Ltd. 1986.
5. PrabhaKundur : Power System Stability and Control -, McGraw Hill, 1994.
6. P.D.Wasserman : `Neural Computing : Theory and Practice' Van Nostrand-Feinhold, New York.

MTEPS204 ADVANCE POWER SYSTEM PROTECTION

L-T-P Team Work Marks: 50

3-1-0 Theory paper Marks: 100

Total Marks:150

Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit 1 :CLASSIFICATION OF STATIC RELAYS : Basic construction of static relays, Classification of protective schemes, Comparison of Static relays with electromagnetic relays, Amplitude comparator,Phase comparator, Principle of Duality.

UNIT 2: AMPLITUDE AND PHASE COMPARATORS(2-INPUT):

Rectifier bridge circulating and opposed Voltage type- Averaging -phase splitting type - Sampling type of amplitude Comparison. Block spike type-Phase splitting type- Transistor integrating type-Rectifier bridge type- Vector product type Phase comparison.

Unit 3 STATIC OVER CURRENT RELAYS : Instantaneous- Definite time – Inverse time-Directional- IDMT- Very inverse Time-Extremely inverse time over current relays. Time current characteristics of Over current relays-applications

Unit 4 : DISTANCE PROTECTION: Impedance Relay: operating principle- relay Characteristic-Protective Schemes-Static Impedance Relay- Static reactance relay- static MHO relay-effect of arc resistance,effect of power surges,effect of line length and source impedance on performance of distance relays-Quadrilateral relay – Elliptical relay.-selection of distance relays

UNIT 5: PILOT RELAYING SCHEMES: Wire pilot protection:circulating current scheme-balanced voltage scheme-translay scheme-half wave comparison scheme- Carrier current protection: phase comparison type-carrier aided distance protection-operational comparison of transfer trip and bloking schemes-optical fibre channels

UNIT6: AC MACHINES AND BUS ZONE PROTECTION: Protection of Alternators: stator protection-rotor protection-over voltage protection-over speed protection-Transformer protection: earth faults in transformers-percentage differential protection-protection against magnetic inrush current-generator and transformer unit protection-Bus zone protection: differential current protection-high impedance relay scheme-frame leakage protection

Unit 7 : MICROPROCESSOR BASED PROTECTIVE RELAYS:

Introduction-over current relays-Impedance relay-Directional relay-Reactance relay.

Unit 8: PROTECTION AGAINST OVER VOLTAGES: Protection of transmission lines, stations, and substations against direct lightning strokes-protection against travelling waves-Insulation coordination.

REFERENCE BOOKS

1. Power system protection ---by TSM Rao.
2. Power system protection and switch gear--by Badri Ram& DN Vishwakarma.
3. Switch gear and protection---by MV Deshpande.
4. Protective relaying vol-2 ---by Warrington.
5. Power system protection and switch gear---by Ravindranath&Chandan.

MTEPS205(i) ARTIFICIAL INTELLIGENCE TECHNIQUES (ELECTIVE-II)

L-T-P Team Work Marks: 50

3-1-0 Theory paper Marks: 100

Total Marks:150

Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

Unit – I: Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models.introduction-neural network models-architectures-knowledge representation-learning process-learning tasks.

Unit- II:Feed Forward Neural Networks

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

Unit–III: ANN paradigm-back propagation-RBF algorithms-Hope field networkS

Unit IV : Genetic algorithms-introduction-encoding-fitness function-reproduction operators

Unit V: Genetic modelling-genetic operators-cross over and mutation-generational cycle-convergence of genetic algorithm-

Unit – VI: Classical AND Fuzzy Sets

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT VII:Fuzzy Logic System Components

Fuzzification, Membership value assignment, development of rule base and decision making ystem, Defuzzification to crisp sets, Defuzzification methods.

UNIT VIII: Applications of Ai Techniques-load forecasting-load flow studies-economic load dispatch-load frequencycontrol-reactive power control-speed control of dc and ac motors

REFERENCE BOOKS

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.

2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

MTEPS205(iii) ADVANCED DSP (ELECTIVE-II)

L-T-P
3-1-0

Team Work Marks: 50
Theory paper Marks: 100
Total Marks:150
Exam. Duration: 3 Hrs.

Note:-Students have to attempt any five questions out of eight questions

UNIT-I: Digital Filter Structure

Block diagram representation-Equivalent Structures-FIR and IIR digital filter Structures All pass Filters-tunable IIR Digital Filters-IIR tapped cascaded Lattice Structures-FIR cascaded Lattice structures-Parallel-Digital Sine-cosine generator-Computational complexity of digital filter structures.

UNIT-II: Digital filter design

Preliminary considerations-Bilinear transformation method of IIR filter design-design of Low pass highpass-Bandpass, and Band stop- IIR digital filters-Spectral transformations of IIR filters- FIR filter design-based on Windowed Fourier series- design of FIR digital filters with least –mean- Square-error-constrained Least-square design of FIR digital filters

UNIT-III: DSP algorithm implementation

Computation of the discrete Fourier transform- Number representation-Arithmetic operations-handling of overflow-Tunable digital filters-function approximation.

UNIT-IV Analysis of finite Word length effects

The Quantization process and errors- Quantization of fixed -point and floating -point Numbers-Analysis of coefficient Quantization effects - Analysis of Arithmetic Round-off errors-Dynamic range scaling-signal- to- noise ratio in Low -order IIR filters-Low-Sensitivity Digital filters-Reduction of Product round-off errors using error feedback-Limit cycles in IIR digital filters- Round-off errors in FFT Algorithms.

UNIT V: Power Spectrum Estimation

Estimation of spectra from Finite Duration Observations signals – Non-parametric methods for power spectrum Estimation – parametric method for power spectrum Estimation-Estimation of spectral form-Finite duration observation of signals-Non-parametric methods for power spectrum estimation-Walsh methods-Blackman & torchy method.

REFERENCE BOOKS

1. Digital signal processing-sanjit K. Mitra-TMH second edition
2. Discrete Time Signal Processing – Alan V.Oppenheim, Ronald W.Shafer - PHI-1996 1st edition-9th reprint
3. Digital Signal Processing principles, algorithms and Applications – JohnG.Proakis -PHI – 3rd edition-2002
4. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C. Gnanapriya – TMH - 2nd reprint-2001
5. Theory and Applications of Digital Signal Proceesing-LourensR. Rebinar&Bernold
6. Digital Filter Analysis and Design-Auntonian-TMH

MTEPS206 SIMULATION LABORATORY

L-T-P
3-1-0

Team Work Marks: 50
Practical Marks: 100
Total Marks:100
Exam. Duration: 3 Hrs.

1. Y - Bus Formation.
2. Gauss – Seidel Load Flow Analysis.
3. Decoupled Load Flow Analysis.
4. Fast Decoupled Load Flow Analysis.
5. Load Flow Analysis for Distribution Systems.
6. Formation of Z-Bus.
7. Symmetrical and Unsymmetrical fault analysis using Z-Bus.
8. Economic load dispatch without and with transmission loss.
9. Unit Commitment Problem.
10. Hydro-Thermal scheduling problem.
11. Transient stability analysis using point by point method.
12. Step Response of Two Area System with Integral Control and Estimation of Tie Line Power Deviation using SIMULINK