SCHEME OF STUDIES & EXAMINATIONS
FOR
MASTER OF TECHNOLOGY
IN
Electrical Engineering
(Specialization: Electrical Device & Power System)

M. D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS FOR
MASTER OF TECHNOLOGY IN
Electrical Engineering (Specialization: Electrical Device & Power System)

SEMESTER I

S.No	Course code	Course Title	Teaching schedule			Class work	Examination		Total
			L	T	P		Theory	Practical	
1	MTEE-501	Advanced Microcontrollers and its Applications	4	0	0	50	100	-------	150
2	MTEE-503	Advanced Power Systems	4	0	0	50	100	-------	150
3	MTEE-505	Advanced Control systems	4	0	0	50	100	-------	150
4	MTEE-507	Special Electro-Mechanical Devices	4	0	0	50	100	-------	150
5	MTEE-509	Advanced Engineering Mathematics	4	0	0	50	100	-------	150
6	MTEE-5L1	Advanced Control System Lab	0	0	2	50	------	50	100
7	MTEE-5L3	Advanced Microcontrollers and its Applications Lab	0	0	2	50	------	50	100
		Grand Total	20	0	4	350	500	100	950

Note :
1. The paper setter will set each theory paper of 100 marks covering the entire syllabus.
2. The sessionals of Theory and Practical Courses shall also be evaluated on the basis of above marks.
3. The gracing system will be according to rules of M.D.University.
4. In the Semester examination the examiner will set 8 questions in all covering the entire syllabus and Students will be required to attempt only 5 questions.
5. Use of Scientific calculator will be allowed in the examination. However Programmable calculator and cellular phone will not be allowed.

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SEMESTER II

S.No	Course code	Course Title	Teaching schedule			Class work	Examination		Total
			L	T	P		Theory	Practical	
1	MTEE-502	Protection of power system and device	4	0	0	50	100	-------	150
2	MTEE-504	Power system networking and management	4	0	0	50	100	-------	150
3	MTEE-506	Measurement and Instrumentation in power system drives	4	0	0	50	100	-------	150
4		Elective – I	4	0	0	50	100	-------	150
5	MTEE-5L3	Measurement and Instrumentation Lab	0	0	2	50	-------	50	100
6		Lab Elective I	0	0	2	50	-----	50	100
7	MTEE-5S1	Seminar – I	0	0	2	50	------	50	100
		Grand Total	16	0	6	350	400	150	900

Note :
1. The paper setter will set each theory paper of 100 marks covering the entire syllabus.
2. The sessionals of Theory and Practical Courses shall also be evaluated on the basis of above marks.
3. The gracing system will be according to rules of M.D.University.
4. In the Semester examination the examiner will set 8 questions in all covering the entire syllabus and Students will be required to attempt only 5 questions.
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SEMESTER III

S.No	Course code	Course Title	Teaching Schedule			Class work	Examination		Total
			L	T	P		Theory	Practical	
1	MTEE-601	Modeling simulation and evolutionary techniques	4	0	0	50	100	-------	150
2	MTEE-603	Artificial intelligence and Neural Networking	4	0	0	50	100	-------	150
3		Elective II	4	0	0	50	100	-------	150
4	MTEE-6L1	Artificial intelligence and Neural Networking Lab.	0	0	3	50	------	50	100
5	MTEE-6S1	Seminar – II	0	0	2	50	-------	-------	50
6	MTEE-6DI	Dissertation – Phase I	0	0	4	150	-------	-------	150
		Grand Total	12	0	9	400	300	50	750

Note :
1. The paper setter will set each theory paper of 100 marks covering the entire syllabus.
2. The sessionals of Theory and Practical Courses shall also be evaluated on the basis of above marks.
3. The gracing system will be according to rules of M.D.University
4. In the Semester examination the examiner will set 8 questions in all covering the entire syllabus and Students will be required to attempt only 5 questions.
5. Use of Scientific calculator will be allowed in the examination. However Programmable calculator and cellular phone will not be allowed

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SEMESTER IV

S.No	Course code	Course Title	Teaching schedule			Class work	Examination		Total
			L	T	P		Theory	E.VIVA	
1	MTEE-6DF	Dissertation Final Phase	0	0	20	200	-------	400	600
2	MTEE-6S2	Seminar – IV	0	0	2	100	-------	-------	100
		Grand Total	0	0	22	300	-------	400	700

Note :
1. The paper setter will set each theory paper of 100 marks covering the entire syllabus.
2. The sessionals of Theory and Practical Courses shall also be evaluated on the basis of above marks.
3. The gracing system will be according to rules of M.D.University
4. In the Semester examination the examiner will set 8 questions in all covering the entire syllabus and Students will be required to attempt only 5 questions.
5. Use of Scientific calculator will be allowed in the examination. However Programmable calculator and cellular phone will not be allowed

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LIST OF ELECTIVES

S.No	Course code	Course Title	Teaching schedule			Class work	Examination		Total
			L	T	P		Theory	Practical	
Elective I									
1	MTEE-5E2	Signal processing and Application	4	0	0	50	100	-------	150
2	MTEE-5E4	Energy System	4	0	0	50	100	-------	150
3	MTEE-5E6	Generalize Theory of Electrical Machines	4	0	0	50	100	-------	150
4	MTEE-5E8	Power Conditioning	4	0	0	50	100	-------	150
5	MTEE-5E10	Selected Topics in Electric Drives and Power Electronics	4	0	0	50	100	-------	150
6	MTEE-5E12	Selected Topics in Process Control	4	0	0	50	100	-------	150
7	MTEE-5E14	Robotics:	4	0	0	50	100	-------	150
Elective III									
1	MTEE-6E1	Non conventional Energy System and Energy Converters	4	0	0	50	100	-------	150
2	MTEE-6E3	Power System Reliability	4	0	0	50	100	-------	150
3	MTEE 6E5	Selected Topics in Machines	4	0	0	50	100	-------	150

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

Note :
1. The paper setter will set each theory paper of 100 marks covering the entire syllabus.
2. The sessionals of Theory and Practical Courses shall also be evaluated on the basis of above marks.
3. The gracing system will be according to rules of M.D.University
4. In the Semester examination the examiner will set 8 questions in all covering the entire syllabus and Students will be required to attempt only 5 questions.
5. Use of Scientific calculator will be allowed in the examination. However Programmable calculator and cellular phone will not be allowed.

MTEE-501   **Advance Microcontrollers and its Applications**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                        Total Marks: 150 mark
                                                        Exam Duration: 3 Hrs

1.   **Introduction:** 8051, Comparison with microprocessor, pin diagram explanation, internal diagram 8051.

2.   **Instruction Set:**   Addressing mode, data transfer instruction, logical, arithmetic instruction, bit instruction, branching instruction.

3.   **Timers:**   Control Word, mode of timers, simple programming, generation of square wave.

4.   **Serial Interface**:   Introduction, Control Word, mode of serial interface, simple programming

5.   **Interrupts:** Introduction, Control word Simple Programming, generation of waveforms using interrupt, serial interface using interrupt.

6.   **Applications:** Interfacing of memory, intelligent LCD, 8255, ADC, DAC, LED display.

Reference Books:
 1.   8051 μ C Architecture Programming & Applications, K.J. Ayata: Penram International Publishers, India.

2.   S.K. Venkata Ram,'Advanced Microprocessor & Microcontrollers,'Luxmi Pub. Pvt. Ltd., New Delhi

3.   Micro controllers & its applications by B.S. Chhabra, Dhanpat Rai Pub. Co., India

4.   8051 μ C, Scott Mackenizie, PHI, Englewood Cliffs, New Jersey.

5.   Myke& Predko,'Programnming & Customizing the 8051 Microcontroller,' Tata McGraw-Hill Pub. Co. Ltd., New Delhi.

MTEE-503   **Advanced Power System**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                         Total Marks: 150 mark
                                                         Exam Duration: 3 Hrs

Natural frequency and free oscillations, forced mechanical oscillations; EHV AC transmission;protection and compensation; HV DC transmission; Design considerations; system; DC links;Mixed mode operation; performance in AC and DC mixed system; Power system transients in LV,HV and EHV system.Sparse system , Theorems of sparse, Matrix Method, Applications Areas, Direct Solutions, Sparsiting and ordering.

Reference Books:

1.   Advance Power System, Stevenson & Grauger; Wadhwa

2.   E.w.Kimbark, 'Power System Stability, Vol. I, John Wiley & Sons, 1948-A Book

3.   P.C.Magnusswon, 'the Transient Energy Method of Calculating Satability',
        AIEE rans, Vol. 66,pp. 747-755,1947

4.   P.D.Aylett, 'Energy Integral Creation of Transient Stability Limits of Power
        System'

5 .   K.R.Padiyar, "Power System Dynamics: Stability and Control", John Wiley
        and   Interline, 1996-A Book

MTEE-505   **Advanced Control System**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                     Total Marks: 150 mark
                                                     Exam Duration: 3 Hrs

State variable analysis of continuous system , digital control system, state description of digital processor , state description of sampled continuous –time plants , state description of systems with dead-time , solution of state equation , canonical variables , controllability & obsrevability , pole –placement design : state regulator design & servo design , design of state observer , compensator design by the separation principle , digital control system with state feedback.
 Describing Function Analysis: Describing functions of common non-linearities, stability analysis by the describing function method.
Phase plane methods of obtaining trajectories for linear & non-linear systems (methods of Isocline, Delta method), stability analysis, limit cycles.
Series approximation method for small non-linearities, perturbation method for second order system.
Lyapunov stability analysis : Lyapunov stability theorem, Lyapunov instability theorem, Lyapunov functions for linear systems, Lyapunov functions for non-linear system : the Krasovskii method, the Variable-Gradient method, canonic form of Lure stability criteria ,TVP system.
Linear Quadratic Optimal Control : Calculus of variations and minimum principle , Optimal Feedback Control : Optimal State
Regulator through the Matrix Riccati equation, Numerical solution of the Riccati equation

Reference Books:

1. Gopal M.- Digital Control & State Variable Methods (2nd Edition);TMG
2. Gopal M-Modern Control system Theory(2nd Edition);New Age International
3. Ogata K-Discrete Time Control System ; Pearson Education
4. Gibson J E- Non-linear Automatic Control ; MGH
5. Stefani – Design of feedback Control System;Oxford University Press
6. Sinha Naresh K.- Control Systems (3rd Edition);New Age International

MTEE-507   **Special Electromechanical Devices**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                       Total Marks: 150 mark
                                                       Exam Duration: 3 Hrs

Linear electro-mechanical devices of different geometry;leviation machines, Force machines and energy machines.
Linear induction motor; Edge and end effects; depth of penetration and its effects. Mathematical modeling.
Review of adjustable speed drives, square wave and sine wave permanent magnet, Brushless machines and drives systems. Reluctance motors; Stepper motor; control circuit and operational characteristics. Disc and claw motors; Hysteresis motors.
Servo motors; DC and AC; position control application; Tacho generators, Synchronous analysis. High performance energy efficient machines. Special machine associated with wind, solar, tidal, wave, micro hydel and other non-conventional energy sources.Motor for robotic drive applications.

Reference Books:

1. Linear Induction Machines, Perfar Nasser, Laithwait

2. Permanent Magnet and Electromechanical Devices by Edward Furlani, Eastman Kodak Company, Rochester, New York, U.S.A.

MTEE-509   **Advance Engineering Mathematics**

L-T-P   Term Work Marks: 50
4-0-0   Theory Paper Marks: 100
                                                   Total Marks: 150
                                                   Exam Duration: 3 Hours

Vector space, linear dependance, bias, linear transformation; inner product space, Hilbert space, Linear functions, Riedsz representation theorem and adjoints.

Orthogonal projections, product of projections; orthogonal direct sums; unitary and orthogonal transformations;orthonormal sets and Parsevals identity; closed subspace and projection theorem for Hilbart spaces. Polynomials, algebra of polynomials, matrix polynomials,annihilating polynomials, invariant subspace; Jordan forms.

Complimentary orthogonal space in networks;graphs, their relation to vector space, properties of their matrix representations; solution of state equations in linear system theory; relation between rational and Jordan forms.

Direct and iternative methods of solution of linear equations; Matrices, norms, complete metric spaces and complete normal linear spaces (Banach spaces); Least square problems(Constrained and unconstrained); Eigenvalue problem.

Reference Books:

1. Hoffman,K.& Kunzc,R.-Linear Algebra; PHI
2. Golub, G.H.& Van Loan,C.F-Matrix computations; North Oxford Academic
3. Bachman,G. & Narici,l-Functional Analysis with Applications; Iohu Wiley

MTEE-5L1   **Advanced Control System Lab**

L-T-P	Term work Marks: 50
0-0-2	Practical Marks: 50
	Total Marks: 100
	Exam Duration: 3 Hrs

Practical will include illustrative working of different control systems and their Simulations in computer will also be carried out covering the Contents of MTEE-5L1

Advanced Microcontrollers and its Applications Lab

L-T-P   Term work Marks: 50
0-0-2   Practical Marks: 50
                                                                               Total Marks: 100
                                                                               Exam Duration: 3 hours

Perform any 8 Assembly Language Programs on Microcontroller Kits from the list given below and their respective applications in Contol Engineering by implementing at least one project.

1. Study of 8051 Microcontroller, Architecture & command.

2. Write an ALP for the Addition & Subtraction of 8 bit no's.

3. Write an ALP for multiplication of Two 8 bit no's.

4. Write an ALP for Division of Two 8 bit no's.

5. Write an ALP to generate 10 KHz square wave on pin P-1.0

6. Write an ALP to find smallest & Largest no in a given array.

7. Write an ALP to generate 10 KHz frequency using interrupt

8. Write an ALP to interface intelligent LCD display with μC

9. Write an ALP for μC & HLL for PC (VB/C++/VC++) to demonstrate/implement serial interfacing.

10. Write an ALP to interface LED display.

11. Write an ALP to interface one μC with other using serial/parallel communication.

12. Write an ALP to switch ON alarm when μC receive interrupt

MT EE- 502　　　　　　**Protection of Power system and Devices**

L-T-P　　　　　　　　　　　　　　　　　　Term work Marks: 50
4-0-0　　　　　　　　　　　　　　　　　　Theory paper Marks: 100
　　　　　　　　　　　　　　　　　　　　　Total Marks: 150 mark
　　　　　　　　　　　　　　　　　　　　　Exam Duration: 3 Hrs

Relays and circuit breakers; Protection of generators; sequence filters; reverse, under frequency, loss of excitation; Rotor earth fault, pole slipping, protection of Turbine; Protection of Transformer; generalized differential protection, Protection due to switching; BUS and substation protection; distance rely, characteristics and critical applications; power swing conditions; Static relays; current, voltage and impedance relays, A standard relaying ; Computer and microprocessor application in protection schemes
Relays and Numerical Relays; reviews of relay characteristics and operating equations, protective CTs, PTs and mixing transformer; Basic construction of static relays, comparators and associated elements, system switching and transient effects, different type of relays, digital and computer aided relaying, BUS bars and switch gear, Bus bar arrangement and design consideration, review of earth formation and interruption of current in circuit beakers; study and operation of air-blast, SF_6 ; Vacuum and DC-circuit breakers; selection and design consideration, tests method as per standard.
Application of our electronically actuated strategies for improved protection and security.

 Reference Books:

 1. Power System Protection: Paithankar & Bhide
 2. Power System Stability: E.W.Kimbark .Vol -I,II,III
 3. Power System Dynamics & Stability Control: K.R.Padiyar,
  John Wiley and Interline, 1996
 4. Flexible AC Transmission System: Y.H.Song and A.T.Jhons, IEE,1996(A Book)
 5. Adaptive Control: S.Sastry and M.Boron, Prentice Hall of India Ltd. 1993
 6. Power System Stability Control: P.Kundur,Mc Grawhill, New York, 1994
 7. Power System Control & Stability: IEE Press, New York,

MTEE-504   **Power System Networking and Management**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                         Total Marks: 150 mark
                                                         Exam Duration: 3 Hrs

Role of Reactive Power on Voltage and Voltage Regulation, Relation Between Incremental Reactive Power, Active Power and Voltage at a Node, Reactive Compensation in Power System, Types of Compensator, Sub-Synchronous Resonance, Flexible AC Transmission systems (FACTS), Control of Voltage-Control by Generators, Control by VAR generators, Control by Transformers.

Automatic Load Frequency Control of Single Area Systems, Speed Governing System, Model, Block Diagram, Static and Dynamic Response with and without Integral Control, Control Area Concept, Two Area Load Frequency Load Frequency Control, Digital LF controller, De-centralized Control, Automatic Voltage Control-Block Diagram.

Concept of Stability: Steady State, Dynamic and Transient Stability, Voltage Stability-Voltage Collapse.

The Synchronous Machine-Three Phase Generation, Synchronous Reactance and equivalent circuits, Real and Reactive Power Control, Loading Capability Diagram, The Two Axis Machine Model, Voltage Equations, Salient Pole-Machines, Transient and Sub-Transient Effects, Short Circuit Currents-Problem.

Dynamic Analysis and Modeling of Synchronous Machines, Excitation System, the Prime Mover and Governing System, Induction Machine Modeling.

 Reference Books:

1. E.W.Kimbark, 'Power System Stability, Vol. I, John Wiley & Sons, 1948
2. Power System Engineering-I J Nagrath, D P Kothari, Tata McGraw-Hill
3. Electrical Power System-C L Wadhwa, New Age International (P) Limited Publication.
4. Power System Analysis-John J Granger, Willium D Stevenson, Tata McGraw-Hill
5. Electrical Energy system Theory-O. L. Elgerd Tata, McGraw-Hill
6. A Text Book on Power System Engineering-Sony Gupta Bhatnagar & Chakrabarti, Dhanpat Rai and Co.
7. Advanced Power System Analysis and Dynamics-L P Sing, New Age International (Private) Limited Publication

MT EE -506   Measurements and Instrumentation in Power System Drives

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                         Total Marks: 150 mark
                                                         Exam Duration: 3 Hrs

Review of transducers and sensors, definition, classification of errors, their characteristics and parameters; Amplifiers and dividers. Timers, Multiplexes, Signal converters ADC and DAC, Instrumentions and Signal processing, Isolaters, Data acquisition system, Basic structure, Data acquisition of Drive related variables.

Reference Books:-

1. Measurements and Instrumentation in Power system drives by Swahani, Driscol Coughlin, Malvino
2. FACTS by Mathur & Verma, IEEE- Press
3. Electronic Measurements   and Instrumentation by A. K. Shawney

ELECTIVE- I

MTEE -5E2   **Signal Processing and Application**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                            Total Marks: 150
                                                            Exam Duration: 3 Hrs

Discrete time Signal & System - Discrete time signal and sequences; resolution of discrete- time signal into impulses; analysis of discrete- time LTI system; convolution seem consality and stability; difference equations and their solutions,response to complex exponential signals; frequency response function

Transforms - Representation of sequences by fourier transform; Z transforms, ROC; LTI in Z domain; samplurg, frequency domain representation, applicition of Z transform in transient A.C. signal filtering.

Discrete-time system -- Block diagram representation of linear constant coefficient difference equation; direct form I and II, cascade form , parallel form ; finite precision ward- length effect , number representation ; effect of quentization and rounding of noise; zero input limit cycles in fixed point realization.

Filter design -- Design of FIR filters by windowing; Butterworth and chebyshew filters; IIR filters impuls invariance and bilinear transformation.

Discrete fourier transform-- Frequnecy domain sampling; The DFT; linear and circular convolation; application in. A.C. transient signal analysis FFT algorithms, DIT and DIF.

Apllication -- Dual tone multifrequcy signal detection; spectral analysis; application in power system,image processing; multidimensional digital signal processing.

Reference Books

1. openheim & Schafer -- Discrete time signal processing; PH
2. proakes & Manolakes --Digital signal processing ; PHI
3. Mitra , S.k. --Digital signal processing ; TMH.
4. B.C.Kuo-- Digital signal processing
5. M.Gopal--Digital signal processing

MTEE-5E4   **Energy System**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                         Total Marks: 150 mark
                                                         Exam Duration: 3 Hrs

Energy ecology and balance; Energy management and accounting ; Energy conservation ; Energy conversion process ; Energy transportation; non-conventional energy resources; Solar, geothermal ,wind, hydrogen, nuclear energy.

Reference Books:-

Power Plant by NagPal

MTEE-5E6   **Generalized Theory of Electrical Machines**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                          Total Marks: 150 mark
                                                          Exam Duration: 3 Hrs

Matrices analysis of Electrical machines, invariance of power, Modeling and their solutions, Generalised of first kind: quasi holonomic reference frame, impedance matrics, torque matrix, flux and current density matrics; modeling DC machines: steady state and transient analysis; repultion and universal machines, cross field generator; steady state and transient analysis; Matrix analysis of single and three phase transformer under steady staste and transient conditions; rectifier transformer. Generalised theory of electrical machines in rotational frame; Holonomic aand nonholonomic reference frame; Torque matrix, voltage and impedance matrix, analysis of single phase and three induction machines;analysis using revolving field theory; sequence reference frame; state space modeling of electrical machines; Equivalent circuits, synchronous generator under sudden short circuit; generalized fault analysis.

Reference Books:-
1. Electric Machine by P. S. Bhimra;
2. Electric Machine by B.L Theraja;
3. Electric Machines by M.G.Say; Kleton

MTEE -5E8   **Power Conditioning**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                         Total Marks: 150 mark
                                                         Exam Duration: 3 Hrs

Concepts of nonlinear loads and electric power conditioning, unity power factor rectifier, STATCON , SMPS: analysis design and control, Ups; On line and OFF line, power supplies in telecommunication systems. High frequency induction heating, dielectric heating, power supply in auto mobiles.
Passive filters, active filters for harmonic and reactive power compensation in two wire, three wire four wire AC systems.
Harmonic standard, power quality, Surge suppress, compensation of arc furnace and traction loads. Micro wave ovens, light and temperature controllers, power supply for appliances such as camera,
X-rays equipments. Case studies on micro computer and DSP control in active filters and power supplies.

 Reference Books:-

1.   Power conditioning, F.F.Kuo
2.   FACTS by Mathur & Verma, IEEE- Press

MTEE-5E10   **Selected Topics in Electric Drives and Power Electronics**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                                  Total Marks: 150 mark
                                                                   Exam Duration: 3 Hrs

LCI-IM Drive : Drive configuration; Communication at different speed; Control structure.
FOC-IM Drive :Drive Configuration;mathematical modeling; direct and indirect FOC
Stepper motor and Drive configurations. Brush less DC drive configuration. Low speed
commutation.Inverter control strategies.
Permanent magnet SM drive converter configuration. Synchronization, Trapezoidal and
sinusoidal drive control structure.
Principle of soft switching in inverters.
Resonant converters; Modeling strategies. Analysis and design of Power Electronics
Circuit .

Reference Books:-

1. Power Electronics,Rashid,
2. Power Electronics by P.C.Sen,
3. Electric Deviced & Power Devices Nedmoohan

MTEE-5E12   **Selected Topics in Process Control:**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                   Total Marks: 150 mark
                                                   Exam Duration: 3 Hrs

Process control and system design: flow diagram, instrument diagram, plant design for controllability and absorbability, dynamic nonlinearity degree of freedom, pairing of variables, design of multivariable system; Measurement of dynamic response, steady state and random technique, pulse technique, model fitting technique; Dynamic modeling of process system; timer and time function controller, control time, time fluctuation characteristics, time cycle controller; components, functions and usages; application of processes computer; system design, optimization, direct digital control, distributed control, Fuzzy technique of control; Auidics: Fluid control device, bistable amplifier, control valve flowmeter; Turbine control and protection; Numerical control; major classes and operating principle.

Reference Books:

1. Control System by C.D. Johnson
2. Discrete Control by M.Gopal
3. "An Introduction to Fuzzy Control" : D, Driankov, H. Hellendoom & M. Reinfrank.:
4. "Fuzzy Control Systems" : ABRAHAM Kandel & Gideon Imngholz;(Narosa)
5 . "Fuzzy Logic" Intelligence, Control and Information : John Yen & Rena Langari;

MT EE-5E14   **Robotics**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                        Total Marks: 150 mark
                                                        Exam Duration: 3 Hrs

Introduction: Robot,its evaluation; definition and laes of robotics, present application status. Robot anatomy: configuration, robot motions, work volumeRobot drives, actuators and control; Functions and types of drives and actuators
Concept of basic control systems, open loop, close loop, different type of controllers, ON-OFF, proportional, integral, PI, PD, PID.
Robot end effectors: Types of end effecters, mechanical gripper, tools and end effectors.
Robot sensors: Transducers and sensors; analog and digital transducers; types of sensors, tachfile sensors, proximity and rough sensors ; miscellaneous sensors; vision systems; use of sensors in robotics.

Robot kinematics: Position representations; forward and reverse kinematics of three and four degrees of freedom; robot arm; homogeneous transformations and robot kinematics ; kinematics equations using homogeneous transformation .
Industrial application: Capabilities of robots; robot applications; materials handling; pick and place operation; palletiging and depalletiging; machine loading and unloading; machine casting; welding;painting, assembly; inspection; maintenance.

Reference Books

1. Schilling-Fundamental of robotics; PH
2. Yoshikawa- Fundamental of robotics; PH
3. S.R.Deb-Robotics Technology and Flexible Automation
4. Introduction to Robotics, John J Craig; Pearson Education

MTEE-5L2   **Lab Elective 1**

L-T-P   Term work Marks: 50
0-0-2   Practical Marks: 50
                                                             Total Marks: 100
                                                             Exam Duration: 3 Hrs

Lab will be based on respective elective subject chosen. Practical will include illustrative working of respective subjects contents and their Simulations in computer will also be carried out (if feasible) covering the Contents of MTEE-5L2

MTEE-5L4   **Measurement and Instrumentation Lab**

L-T-P   Term work Marks: 50
0-0-2   Practical Marks: 50
                                                          Total Marks: 100
                                                          Exam Duration: 3 Hrs

Perform any 10 Experiments based on the Syllabus of respective subject and implement a
hardware model as a project.

MTTE-5S1   **Seminar – I**

L-T-P   Term work marks: 50
0-0-2   P/VV Marks: 50
                                                           Total Marks: 100
                                                           Exam Duration: 3 Hrs

Seminar - II shall be based on tentative topic on dissertation such as review paper on some specific well defined area/specialized stream of automobile engineering. Each student has to prepare a write up of about 25 pages of "A4" size sheets and submit it in duplicate as the term work.

The student has to deliver a seminar talk in front of the faculty members of the department and his classmates. The faculty members, based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally – jointly. Some marks should be reserved for the attendance of the student in the seminars of the others students.

MTEE-601   Modeling Simulation and Evolutionary Techniques:

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                               Total Marks: 150 mark
                                               Exam Duration: 3 Hrs

Modeling and classification: mathematical, physical and analog models. Estimation of model parameter. System identification, Experimental nature of simulation. Step involves in simulation studies validation of simulation models, Computer simulation of continuous and discrete system.
Neural network, Different network configurations. Feed forward and recurrent networks; Training algorithms; identification; pattern recognition; system modeling and state estimation.
Fuzzy logic concept; Fuzzy relations and membership functions; Defuzzification; Fuzzy controllers.
Genetic Algorithm concepts; schemata; coding; Reproduction; Cross over mutation; Scaling and fitness.

Reference Books:-

1. Nuero Fuzzy networks, Genetic algorithm in Fuzzy controllers by Rajaraman
2. "An Introduction to Fuzzy Control" : D, Driankov, H. Hellendoom & M. Reinfrank.:
3. "Fuzzy Control Systems" : ABRAHAM Kandel & Gideon Imngholz;(Narosa)
4. "Fuzzy Logic" Intelligence, Control and Information : John Yen & Rena Langari;

MTEE-603   **Artificial intelligence and Neural Networking**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                             Total Marks: 150 mark
                                                             Exam Duration: 3 Hrs

Fundamentals of ANN, Biological prototype, Neural Network Concepts, Definitions –
Activation, Functions,single layer and multilayer networks, Training ANNs, perceptrons,
Exclusive OR problem, Linear seperability,storage efficiency, perceptron learning - perceptron
training algorithms, Hebbian learning rule - Delta rule,Kohonen learning law, problem with the
perceptron training algorithm.
Back propagation neural network, Training algorithm, network configurations, Back propagation
error surfaces, Back propagation learning laws, Network paralysis - Local minima, and temporal
instability Counter propagation Networks, Kohonen layer, Training the Kohonen
layer,preprocessing the input vectors,initializing the weight vectors.
Statistical properties, Training the Grossberg layer- Feed forward counter propagation Neural
Networks,Applications.Statistical methods simulated annealing, Bloltzman Training, Cauchy
training - artificial specific heat methods,Application to general non-linear optimization
problems, back propagation and cauchy training.Hopfield network
Problem solving methods; control strategy, Heuristic search, reasoning, Breadth, depth, and best
propogation,Hopfield model, Applications.

Reference Books:-
1. Artificial intelligence and Neural Networking, Patesson
2. Neural Netwoks by Jeannette Lawrence
3. Neural Networks by simon Hykins
4. Neural Networks by Zurada

ELECTIVE-III

MTEE-6E1   **Non conventional Energy System and Energy Converters:**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                   Total Marks: 150 mark
                                                   Exam Duration: 3 Hrs

Review of energy source, Importance of non conventional source such as Solar, Bio gas, Wind, Tidal and associated systems. Study of typical energy converters such as High performance machine, special generator driven by Bio gas engine, wind turbines etc, mini hydro generators, MHD, Fuel Cells, Bulb generators. Modern state-of-art and futuristic system.

Reference Books :–

1. Energy Management by Nagpal

MTEE-6E3   **Power System Reliability**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                         Total Marks: 150 mark
                                                         Exam Duration: 3 Hrs

Fundamental concepts of reliability, generation system reliability, operating research, evaluation,transmission and distribution system reliability, inter connected system reliability, bulk power system reliability. Application of power electronically actuated strategic for enhancement of reliability and security.

Reference Books:-

1. Testing Method of Reliability, A.Simpson,
2. Power System K.C.Kapur
3. Power System Relaibility L.R.Labenson

MTEE-6E5   **Selected Topics in Machines:**

L-T-P   Term work Marks: 50
4-0-0   Theory paper Marks: 100
                                                 Total Marks: 150 mark
                                                 Exam Duration: 3 Hrs

Design limitations in large electrical machines. Effect of discontinuity in magnetic circuit on performance. Design of high performance, high efficiency machines. Effect on other design parameters. CAD on electrical machines. Winding configurations and computer aided design of distributed windings.
Multi phase configuration in synchronous and induction machines-security consideration and economics.
Abnormal operation of induction machines. Excitation spectra aspects on induction generator in rush current phenomenon in transformer, effect of space harmonics.

Reference Books:-

1. Electric Machines by M.G.Say
2.Electric Machines by Dr S.K.Sen,
3. EMMI by A.K.Sawney

MTEE-6L1 **Artificial intelligence and Neural Networking Lab**

L-T-P Term work marks: 50
0-0-2 P/VV Marks: 50
Total Marks: 100
Exam Duration: 3 Hrs

Practical will include MATLAB implementation of different Neural Networks and their Simulations in computer will also be carried out covering the Contents of MTEE-6L1.

MTTE -6S1   **Seminar – II**

L-T-P   Term work marks: 25
0-0-2   P/VV Marks: 25
                                                        Total Marks: 50
                                                        Exam Duration: 3 Hrs

Seminar – II shall be based on the work carried out for dissertation. This may cover the point right from various areas considered and analysis, the relevance feasibility and scope of work for finally selected topic, alternative solution and appropriate solution. Each student has to prepare a write up of about 25 pages of "A4" size sheets and submit it in duplicate as the term work.
The student has to deliver a seminar talk in front of the faculty members of the department and his classmates. The faculty members of the department shall do an assessment, based on the quality of the work and preparation and understanding of the candidate. Some marks should be reserved for the attendance of the student in the seminars of the others students.

MTEE 6DI   **Dissertation – Phase I**

L-T-P   Term work marks: 50
0-0-4   P/VV Marks: 100
                                                         Total Marks: 150
                                                         Exam Duration: 3 Hrs

The term work under this, submitted by the student shall include –
1. Work diary maintained by the student and counter signed by his guide.
2. The contents of work diary shall reflect the efforts taken by candidate for
(a) Searching the suitable project work
(b) Visits to different factories or organizations
(c) Brief report of journals and various papers referred
(d) Brief report of web sites seen for project work
(e) The brief of feasibility studies carried to come to final conclusion
(f) Rough sketches
(g) Design calculation etc. etc. carried by the student.

The student has to make a presentation in front of panel of experts in addition to guide as decided by department head.

MTEE -6DF   **Dissertation Final Phase**

L-T-P   Term work marks: 200
0-0-20   External viva marks: 400
                                                          Total Marks: 600

The dissertation submitted by the student on topic already approved by university authorities on the basis of initial synopsis submitted by the candidate shall be according to following guidelines
Format of dissertation report –
The dissertation work report shall be typed with double space on A4 bond paper. The total number of pages shall not be more than 150 and not less than 60. Figures, graphs, annexures etc. be added as per requirement. The report should be written in the following format.
1. Title sheet
2. Certificate
3. Acknowledgement
4. List of figures / photographs / graphs / tables
5. Abbreviations
6. Abstract / final synopsis
7. Contents
8. Text with usual scheme of chapters
9. Discussion of the results and conclusion
10. Bibliography (The source of illustrative matter should be acknowledged clearly at appropriate place)

MTEE- 6S2   **Seminar – IV**

L-T-P   Term work marks: 50
0-0-2   P/VV Marks: 50
                                                         Total Marks: 100
                                                         Exam Duration: 3 Hrs

Student has to choose topic of his interest in an emerging area with approval of supervisor and Committee, appointed by Head of the Department for this purpose. He has to do an in depth exhaustive study on his topic throughout the semester under the guidance of his supervisor. At the end of the semester, student has to submit report. He will present his work in a seminar. Evaluation will be based on continuous monitoring of his contribution during the semester by his supervisor and the report and seminar evaluation by the Committee appointed by Head of the Department.