M.D. UNIVERSITY, ROHTAK
CURRICULUM STRUCTURE AND SYLLABUS FOR
M. TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING
w.e.f. Session 2015-16

SEMESTER-I

Course No.	Course Title	Teaching Schedule (Hours)			Marks			Duration of Exam (Hours)
		L	T	P	Sess-ional	Exam	Total	
MTEEE-501	Power Electronics Drive Control	4	-	-	50	100	150	3
MTEEE-503	Advanced microprocessor and controller	4	-	-	50	100	150	3
MTEEE-505	Advanced Digital Signal Processing	4	-	-	50	100	150	3
MTEEE-507	Advanced Computer Power System Analysis.	4	-	-	50	100	150	3
MTEEE-***	ELECTIVE-I	4	-	-	50	100	150	3
MTEEE-509	Advanced Computer Power System Analysis. Lab	-	-	3	50	50	100	3
	Total	**20**	**-**	**3**	**300**	**550**	**850**	

Elective-I

Course No.	Course Title
MTEEE-513	Computer control System.
MTEEE-515	DIGITAL IMAGE PROCESSING
MTEEE-517	Renewal Energy in Electrical System
MTEEE-519	EHVAC Transmission

M.D. UNIVERSITY, ROHTAK
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M. TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING
w.e.f. Session 2015-16

SEMESTER-II

Course No.	Course Title	Teaching Schedule (Hours)			Marks			Duration of Exam (Hours)
		L	T	P	Sessional	Exam	Total	
MTEEE-502	Advanced Switchgear and Protection	4	-	-	50	100	150	3
MTEEE-504	AI Techniques	4	-	-	50	100	150	3
MTEEE-506	FACTS Controller	4	-	-	50	100	150	3
MTEEE-508	Distributed Computer Control System	4	-	-	50	100	150	3
MTEEE-***	Elective-II	4	-	-	50	100	150	3
MTEEE-510	Power System Simulation Lab	-	-	3	50	50	100	3
	Total	**20**	**-**	**3**	**300**	**550**	**850**	

Elective-II

Course No.	Course Title
MTEEE-514	Special Purpose Electrical Machine.
MTEEE-516	Robotic & Automation
MTEEE-518	Demand Side Energy Management
MTEEE-520	Optimal Control Theory

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M. TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING
w.e.f. Session 2016-17

SEMESTER-III

Course No.	Course Title	Teaching Schedule (Hours)			Marks			Duration of Exam (Hours)
		L	T	P	Session-ional	Exam	Total	
MTEEE-601	PLC Controller and their Application	4	-	-	50	100	150	3
MTEEE-603	Process Control	4	-	-	50	100	150	3
MTEEE-***	Elective-III	4	-	-	50	100	150	3
MTEEE-605	PLC Controller Lab	-	-	3	50	50	100	3
MTEEE-607	Process Control Lab	-	-	3	50	50	100	3
MTEEE-609	Minor Project	-	-	3	50	50	100	3
	Total	**12**	**-**	**9**	**300**	**450**	**750**	

Elective-III

Course No.	Course Title
MTEEE-611	Artificial Neural Network based Control
MTEEE-613	Smart Grid
MTEEE-615	HVDC Transmission
MTEEE-617	Embedded System Design
MTEEE-619	Modern Control Theory

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w.e.f. Session 2016-17

SEMESTER-IV

Course No.	Course Title	Teaching Schedule			Marks			Duration of Exam (Hours)
		L	T	P	Sess-ional	Exam	Total	
MTEEE-602	Dissertation	-	-	20	150	600	750	3
	Total	**-**	**-**	**20**	**150**	**600**	**750**	

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 has 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 mentioned 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 reappear in that subject.

POWER ELECTRONICS DRIVES CONTROL

MTEEE-501

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT- I

Power Semiconductor Controlled Drives: Dynamics of motor Load System, Convertor Motor System, Speed Control and multiquadrent operation, Power Semiconductor devices such as Thyristers, GTO, Power Transistor, Power MOSFETS Natural and Forced Commutation.

UNIT- II

Rectifier controlled of DC motors: Control rectifiers circuits breaking operator of separately excited motors. Comparative study of Armature controlled Motor using – Single Phase, three phases – half and fully controlled rectifier.

UNIT- III

Chopper Controlled DC Motors: Principle of operation and control techniques, Motoring operation of separately excited and series motor. Regenerator Breaking of DC motors multiquadrent control of chopper fed motors.

UNIT- IV

AC Voltage controlled induction motor: Four quadrant control and closed loop operation AC Voltage controller starters. AC Frequency, controlled induction motor: Control by voltage sources invertors, current source invertors current controlled PWM invertors and cycle convertors and its types.

TEXT BOOKS:

1. Power Semiconductor Controlled Drive – by G.K. Dubey Prentice Hall International.
2. Power Semiconductor Drive: by S.B. Dewan, G.R. Slemon and A. Straugher, John Wiley & Sons Publication.
3. A First Course on Electrical Drive – by S.K. Pillai New Age International Publication.
4. Power Electronics – by P.S. Bhimbrs, Dhanpat Rai Publication.
5. Power Electronics – Rashid: PHI Publication.
6. Power Electronics: Convertor, application and Design by Mohan, underland and Robbins, John Willey and Son.
7. Modern Power Electronics & AC Drives – Bose: Pearson Education.
8. Microprocessor Control of Power Electronics & Drive Bose B.K. IEEE Press.

ADVANCED MICROPROCESSOR & MICROCONTROLLERS

MTEEE-503

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT- I

Design of basic microprocessor architectural Concepts : Microprocessor architecture, word Lengths, addressable memory, Microprocessor's speed architectural characteristics , registers, instruction, memory addressing architecture,

UNIT- II

Microprocessor Instructions & Communication: Instruction Set ,Mnemonics, Basic Instruction Types, Addressing modes, Microprocessor I/O connecting I/O put to Microprocessor ,Polling and Interrupts , Interrupt and DM. Controllers.

UNIT- III

Microprocessor I/O: Data Communication, parallel I/O serial communication, Serial interface and UART modems, I/O devices, D/A,A/D interface, special I/O devices. Microcontroller: Introduction 8051 architecture and programming model.

UNIT- IV

Advanced microprocessors: Intel X86 family of advanced Microprocessor, programming model for 86 family. X85 addressing modes, instruction set, hardware. Introduction to the Design Process, Preparing the specifications, Developing a design, Implementing and Testing and design,

Text Books:

1. C.M. Gilmore, "Microprocessors Principals and Application", MGH
2. Rajkamal, "Embedded System, Architecture & Programming", TMH

Reference Books:

1. Berry B. Berry, " Inter Series of microprocessors", PHI
2. D. V. Hall, " Microprocessor & Interfacing", TMH
3. Peatman, "Microprocessor Based System Design", Pearson

ADVANCED DIGITAL SIGNAL PROCESSING

MTEEE-505

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT- I

Introduction of DSP: Introduction to Signal Processing, Discrete Linear Systems, superposition Principle, Unit-Sample response, stability & causality Criterion. Fourier Transform & inverse Fourier transform: Frequency, Fourier transform, use of Fourier transform in Signal processing. The inverse fourier transform, Sampling continuous function to generate a sequence, Reconstruction of continuous -time signals from Discrete-time sequences.

UNIT- II

Digital Filter Structure & Implementation: Linearity, time invariance & causality, the discrete convolution, the transfer function, stability tests, steady state response, Ideal LP Filter, Physical reliability & specifications.FIR Filters, Truncation windowing & Delays, design example, IIR Filters: Review of design of analog filters & analog frequency transformation. Design of LP filters using impulse invariance method, bilinear transformation.

UNIT- III

Implementation of Filters: Realization block diagrams, Cascade & parallel realization, effect of infinite-word length, transfer function of degree 1&2, Sensitivity comparisons, effects of finite precision arithmetic on Digital filters.

UNIT- IV

DFT & FFT & Z transform with Applications: Discrete Fourier transform, properties of DFT, Circular Convolution, Fast Fourier Transform, Realizations of DFT. The Z-transform, the system function of a digital filter, , computation of Fourier series & time sequences from spectra.

Text Books

1. Alam V. Oppenheim & Ronald W. Schafer, “Digital Signal Processing” PHI.
2. JG Proakis, “Digital Signal Processing”, (PHI) 3rd Edition.

Reference Books

1. Rabiner & Gold, “Theory & application of digital Signal Processing”, PHI 1992.
2. Roman kuc, “Introduction to Digital Signal Processing,” Tata McGraw hill Edition.

ADVANCED COMPUTER POWER SYSTEM ANALYSIS

MTEEE-507

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT- I

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 commitment problem solutions by Dynamic programming Approach. DP method over priority list scheme, Back word DP approach, forward DP approach algorithm and their flow charts solution UCP using Dynamic program method.
Model representation of transmission line introduction, performance of transmission systems, Ferranti effect, Introduction, State Estimation.

UNIT- II

LOAD FLOW STUDIES: Load flow equations, Approximate Load flow study, Gauss-Seidel method for Load flow Study, Algorithm and flow Chart for Computer application to Load flow studies, Newton-Raphson method for Load flow studies, Algorithm and flow chart for Computer Application.

UNIT- III

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

UNIT- IV

SYMMETRICAL AND UNSYMMETRICAL FAULT ANALYSIS: Symmetrical Components, Sequence networks for synchronous machines, transforms and transmission Lines, digital technique in short circuit Studies of: Single line to ground fault, Line to Line fault, Double line to Ground fault and symmetrical fault. Consideration of Pre fault currents.

TEXT BOOKS:

1. Power System Stability & Control by Prabha Kundur.
2. Computer methods in power system by G. W. Stagg and A. H. El-Abiad: M.G.H.

REFERENCE BOOKS:

1. Advance power system analysis and dynamics by L.P. Singh: Wiley Eastern ltd.
2. Elements of power system analysis by W. D. Stevenson: M.G.H.
3. Power System Engineering by I.J.Nagrath & D.P.Kothari: TMH.

ADVANCED COMPUTER POWER SYSTEM ANALYSIS LAB

MTEEE-509

L	T	P
-	-	3

Marks

Exams : 50
Sessionals : 50
Total : 100
Duration of Exam: 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

ADVANCED SWITCH GEAR & PROTECTION

MTEEE-502

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Circuit Breakers: Theory of arc interruption, restriking voltage transients, current chopping in circuit breaker, circuit breaker ratings, duties of switch gear, automatic switch, air circuit breaker, bulk oil, minimum oil, air blast, SF6 CB, vacuum and DC circuit breakers, Design & Testing of CB, Equipment used in the station.

UNIT-II

Protective Relays: Nature and causes of faults, consequences, zone of protection, essential qualities, primary and backup protections, relay classification, principal types of electromagnetic relays, i.e. attracted armature, induction disc, induction cup types, Relay Characteristics: Over -current, instantaneous over current, IDMT, directional and differential relays, distance relays, plain impedance, mho, reactance, offset mho type, pilot wire and carrier current protection, neutral grounding.

UNIT-III

Apparatus Protection: Transformer, generator, motor and bus zone protection, transmission and feeder.

UNIT-IV

Static and Numerical Relays: Classification of static relays, amplitude and phase comparators, and blockspike and block-average comparators, rectifier type relays. Traveling wave relay, relaying schemes based on microwave and optical fiber link, protection of FACTS devices, digital relaying, its architecture, Numerical Protection: Numerical protection of transmission line.

TEXT BOOKS:

1. Power System protection and switchgear by B.Ram, D.N.Vishvakarma: TMH.
2. Fundamental of Power System Protection by Y G Paithankar, S. R. Bhide: PHI
3. Power System Protection & Switch Gear by Ravindra Nathan & Chaner: New Age Pub.
4. Protection and Switchgear by B. Bhalja, R. P. Maheshwari, N. G. Chothani: Oxford University Press.

REFERENCE BOOKS:

1. Protective Relays -Their Theory and Practice Vol.I & II by W.Van: Warrington.
2. Advanced power system analysis and dynamics by L.P.Singh: Wiley Eastern N.Delhi.
3. A course in Electrical Power by Soni, Gupta and Bhatnagar: Dhanpat Rai & Sons.
4. Power System Engg by I.J. Nagrath and D.P. Kothari :TMH.
5. Power System Engineering by V. K. Mehta.
6. Switchgear and protection by S. S. Rao: Khanna Pub

AI TECHNIQUES

MTEEE-504 **Marks**

L	T	P		
4	-	-	Exams	: 100
			Sessionals	: 50
			Total	: 150
			Duration of Exam: 3 hrs.	

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

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.

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– II

ANN paradigm-back propagation-RBF algorithms-Hope field networkS

Genetic algorithms-introduction-encoding-fitness function-reproduction operators

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

UNIT – III

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

UNIT – IV

Fuzzy Logic System Components : Fuzzification, Membership value assignment, development of rule base and decision making ystem, Defuzzification to crisp sets, Defuzzification methods.

Applications of Ai Techniques-load forecasting-load flow studies-economic load dispatch, load frequency control, 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.

FACTS CONTROLLERS

MTEEE-506

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT I

Transmission interconnections, power flow in an AC System, loading capability limits, Power flow and Dynamic stability considerations, importance of controllable parameters. 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 II

Basic concept of Voltage source converter, Single phase full wave bridge converter, Single phase-leg (pole) operation, Square-wave voltage harmonics for a single phase Bridge, 3 Phase full wave bridge converter. 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 III

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. 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 IV

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. 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.

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.

DISTRIBUTED COMPUTER CONTROL SYSTEM

MTEEE-508

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Aim of plant automation, classical approach to plant automation, computer based plant automation, Distributed computer control, Functional levels, Database organization, system implementation concepts, Human interface.

UNIT-II

Field Domain Data Communication link - transfer of process data, Local area network, OSI model of ISO, Manufacturing automation protocols, Buses and Communication network of DCS.

UNIT-III

Software: Real-time operating system communication software, process oriented language, application software, software configuration and parameterization, knowledge based software.

UNIT-IV

Reliability; Reliability concepts in DCS reliability and availability of Multi - computer system, Reliability of software, Reliability design guidelines for DCS. Application: Power Plant, Iron & Steel Plant, Chemical Plant.

REFERENCE:

1. Distributed computer control for Industrial automation – Dobrivoje Popovic and Vijay P. Bhatkar, Dekker Pub.

POWER SYSTEM SIMULATION LAB

MTEEE-510

L	T	P
-	-	3

Marks

Exams : 50
Sessionals : 50
Total : 100
Duration of Exam: 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.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & setup by the concerned institution as per the scope of the syllabus.

PLC CONTROLLER AND THEIR APPLICATIONS

MTEEE-601			**Marks**
L	T	P	Exams : 100
4	-	-	Sessionals : 50
			Total : 150

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT 1

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules. PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

UNIT II

Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system. PLC Registers: Characteristics of Registers, module addressing, holding registers, input registers, output registers.

UNIT III

PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR and Sweep functions and their applications.

UNIT IV

Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions. Analog PLC operation: Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

REFERENCE BOOKS

1. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A.Reiss, Fifth Edition, PHI
2. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.

PROCESS CONTROL

MTEEE-603

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Basic consideration: Introduction to process control system, control loop study, generalization with load changes at arbitrary points in the loop, offset and its analysis, modeling considerations for control purposes, degree of freedom and process controllers, formulating the scope of modeling for process control, computer simulation and linearization of non-linear system transfer functions and input output models,

UNIT-II

Designing feed back controller: Outline of the design problems, selection of type of feedback controller, time-integral performance criterion, process reaction curve and frequency response characteristic, Ziegler-Nichol Rule, effect of dead time, dead time compensator and inverse response compensator.

UNIT-III

Control Systems with multiple loops: Feed forward and cascade control system, Multivariable system & multivariable turning technique non-inferential and over ride control. Interaction & De-coupling of control loop: Interaction of control loops, relative gain array and selection of the loops. Design of non-interaction control loop.

UNIT-IV

Computer process interface for Data Acquisition and control: Introduction to digital, computer control process, optimal and adaptive control of processes, online tuning, process control languages and application packages, operating system for real-time process control.

REFERENCE BOOKS:

1. Chemical Process Control – George Stephanopoulos – PHI Publications.
2. Digital Computer Process Control – C.L. Smith Pub : Intext Educational Publisher.
3. Process Control F.G. Shinkey, Pub. Mc-Graw Hill.
4. Advanced Process Control-W.H. Ray, Pub. Mc Graw-Hill.
5. Process system and analysis and control – D.R. Coushanour, TMH.
6. Prokeess Instrument & Control handbook – D.M. Considins, Pub: Mc-Graw Hill.
7. Chemical Process Control CPC – M. Morari and T.J. McAvoy. CACHE/Elsevier, Amsterdam, 1986 F.G.
8. Handbook of Advance Process Control & Instrumentation Systems-Les Kane, - Gulf Publishing Company, Huston, Texas.

PLC CONTROLLER LAB

MTEEE-605

L	T	P
-	-	3

Marks

Exams : 50
Sessionals : 50
Total : 100
Duration of Exam: 3 hrs.

1) To study Ladder logic programming of a industrial PLC like SEIMENS/FATEK/MICROLOGIX
2) To write programme for control of Drinks machine,.
3) To write a Programme for Car Parking.
4) To study step sequence in a PLC
5) To write a programme & interface simulated hardware unit of Tank level control.
6) To write a programme & interface & control a traffic light using PLC.
7) To write a programme & interface & control a simulated elevator control using PLC
8) To write a programme & interface & control a conveyer belt using PLC
9) To write a programme & interface & control speed of a DC motor using PLC
10) To write a programme & interface & temperature control system using analog outputs of a PLC.

PROCESS CONTROL LAB

MTEEE-607

L	T	P
-	-	3

Marks

Exams : 50
Sessionals : 50
Total : 100
Duration of Exam: 3 hrs.

(A few experiments may be designed & included in this list depending upon the infrastructure available in the institute).

1. To study transient response charters tic of a first order system with variable time constant and variable gain.
2. To study transient response characteristic of a second order system and computations of percentage over shoot, rise time, decay ratio, settling time etc.
3. Study and analysis of the control valve characteristics.
4. Study and Analysis of the characteristic of interacting and non-interacting systems/processes.
5. To study calibration, linearity, hystereris, accuracy and repeatability of IP and PI converter.
6. Implementation of On-Off control.
7. Temperature control of a tubular heat exchanger by manipulating flow rate and heat load.
8. Implementations and configuration of Flow & Level Control using DDC software.
9. Design of P/PI/DID controllers using Zeigler-Nichol (open loop tuning method) for optimal performance of flow control system.
10. Design of P/PI/PID controller using Ziegler-Nichol (closed loop tuning method) for optimal performance of temperature control system.
11. Design of P/PI/PID controller using Ziegler-Nichol method) for optimum performance of a pressure control system.
12. To understand principle and working of a cascade control use in complex system using DDC/SCADA software.
13. Implementation of Ratio Control System.
14. Implementation of Auto Tuning and Adaptive Control System.

Elective-I

Course No.	Course Title
MTEEE-513	Computer control System.
MTEEE-515	DIGITAL IMAGE PROCESSING
MTEEE-517	Renewal Energy in Electrical System
MTEEE-519	EHVAC Transmission

COMPUTER CONTROL SYSTEM

MTEEE-513

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Distributed Digital Control: Introduction, Distributed v/s Centralized, Advantages of DCS system, functional requirements of process control system, system architecture. A/D & D/A Converters, Interfacing with different types of transducer. Intelligent sensors, Fibre optic transducers, silicon transducers, Bio-transducers.

UNIT-II

Computer Network: Serial and parallel interfaces, serial communication lines, parallel database, IEEE 4888 bus, LAN,WAN, programmed I/O operations, interrupt systems, I/O software.

UNIT-III

Real-Time programming: Introduction, Multitasking, Task Management, Intertask communication, Real-Time operating systems Vs Real-Time Programming Language, Real-Time-Programming Language and Real Time operating systems.

UNIT-IV

PLCs: Introduction, principles of operation, Architecture, Programming, software, configuration & applications, PLC Application to process control SCADA System, Hardware Requirement for interfacing SCADA System with PLC. Introduction to design & Planning for computer control project. Illustration from steel plant, Petro-Chemical Plant, Cement Plant & Power plant etc.

REFERENCE BOOKS:

1. Principles of Measurement & Instrumentation – by Alan S. Moris (PHI)
2. Instruments Engr. Handbook 3rd Edition of process control – BELA G. LIPTAK – Editor In-charge Chief.
3. Real Time computer control – Bannel's Linkens: Peter Peragrinns – Hert, U.K.
4. Computer based Industrial control – by Krishan Kant PVA. PHI.
5. Real Time Computing application to Dalta Acquisition and control Pub. Van Nostrand, NY.
6. Programmable controllers for factory automation – Johnaons. NY.
7. Distributed computer control & industrial automation – Bhatkar – Marshal Dekker Publication.

DIGITAL IMAGE PROCESSING

MTEEE-515

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Introduction, characterization of images as two-dimensional discrete helds. Unitary transforms – DFT, Hadamard, Slant and cosine transforms.

UNIT-II

Compression schemes Karhunen Loeve compression predictive coding schemes. Image enhancement gray scale modification, edge enhancement.

UNIT-III

Restoration Wiener filtering constrained deconvolution, recursive filtering, segmentation edge detection thresholding, textural properties,

UNIT-IV

geometry and shape description, Image analysis and computer vision, Image reconstruction from projection and image data projection.

REFERENCES:

1. Digital Image processing – Rafad coonzalex, Richard Woods, Adison Wesley.
2. Fundamental Digital Image Processing – A.K. Jain, PHI
3. Digital Image Processing – Gonzalez, Pearson Education.

RENEWABLE ENERGY IN ELECTRICAL SYSTEM

MTEEE-517

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Introduction to renewable energy sources: wind. Wave. Tidal. Principle of energy conversion systems: wind - wave . tidal. History of renewable energy based electrical power generation. Wind energy conversion devices - aerodynamics. design of rotor. Performance curves. Turbine control- efficiency. Wind speed and direction measurement. Wind speed distribution - other modern developments - future possibilities. Wind energy scenario.

UNIT-II

Grid-connected systems: types of generators . induction generator – equivalent circuit . efficiency . single phase operation of 3-phase induction generators . permanent magnet generator . synchronous generator - different conversion schemes. fixed and variable speed operation . drive selection . power control . braking systems - grid integration issues. Site selection - planning of wind farms - maintenance and operation - environmental assessment - electrical design - power collection systems - earthing . electrical protection .

UNIT-III

Solar radiation - photo voltaic effect - types of PV cells . electrical properties . equivalent circuit - cell characteristics - effects of temperature variation, insolation level and tilt angle . peak power point operation - PV cell model - PV module - design options . site survey and shading analysis - array configurations - economics - environmental issues.

UNIT-IV

Grid connected systems: Technical and non-technical considerations - system size and module choice - mounting systems and building integration- power conditioning system - lightning protection - earthing - metering . Simulation of grid-connected system. Hybrid energy systems.

TEXT BOOKS

1. Wind electrical systems, S.N.Bhadra, D.Kastha and S. Banerjee, Oxford University Press, 2005.
2. Wind and Solar Power Systems, Mukund R. Patel, CRC Press, 1999.

REFERENCE BOOKS

1. Planning and Installing Photovoltaic Systems, Deutsche Gesellshaft Fur Sonnenergie (DGS), Second Edition, Earthscan Publishers, 2008.

EHVAC TRANSMISSION

MTEEE-519

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT I

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

UNIT II

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

UNIT III

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. 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 IV

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 Static reactive compensating systems.

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.

ELECTIVE-II

Course No.	Course Title
MTEEE-514	Special Purpose Electrical Machine.
MTEEE-516	Robotic & Automation
MTEEE-518	Demand Side Energy Management
MTEEE-520	Optimal Control Theory

SPECIAL PURPOSE ELECTRICAL MACHINE

MTEEE-514

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Servomotor- AC servomotors-construction-principle of operation-performance characteristicsdamped AC servomotors-Drag cup servomotor-applications-DC servomotors-field and armature controlled DC servomotors-permanent magnet armature controlled-series split field DC
servomotor.

UNIT-II

Stepper Motors-different types-construction-theory of operation- Comparison Applications. Reluctance Motors-Principle of Operation-Conventional and special types of rotor constructionequivalent circuit-phasor diagram-Characteristics-Applications.

UNIT-III

Switched Reluctance Motors-Principle of Operation- different types-comparison-Applications. Linear Motors-different types-end-equivalent circuit- applications-linear reluctance motor-linear synchronous motors.

UNIT-IV

Brushless DC motors-Different Types-Applications Hysteresis Motor-Principle of operation-constructional details-selection of rotor materialsperformance characteristics-torque equation- applications. Magnetic Levitation Devices-Magnetostatic Repulsion, Magnetostatic Attraction-Electromagnetic repulsion-Magnetic Levitation Vehicles.

REFERENCE:

1. TJ.E. Miller, *"Brushless PMand Reluctance Motor Drives'*, C. Larendon Press, Oxford.
2. Takashi Kenjo % *'Stepping Motor and Microprocessor Control'* , Oxford Science Publications.
3. Vienott & Martin , * *Fractional & Sub fractional hp Electric Motors* \ McGraw Hill International Edn.
4. Irving L Kossow, *'Electrical Machinery and Transformers* \ Oxford Science Publications
5. Theodore Wildi, *'Electric Machines, Drives and Power Systems',* Prentice Hall

ROBOTICS AND AUTOMATION

MTEEE-516

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total :150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Introduction: History, Classification, major components, fixed v/s flexible automation, applications. **Spatial Descriptions and transformation:** Descriptions mappings, operators, transformation arithmetic manipulator‟s kinematics: link description, connection, convention, kinematics, actuator space, joint space and Cartesian space.

UNIT-II

Inverse manipulator kinematics: Solvability, notion of manipulator subspace when n=6; algebraic v/s geometric, algebraic solution, repeatability & accuracy.

UNIT-III

Linear Control of Manipulators: Control low partitioning, trajectory following control, disturbance rejection, continuous v/s discrete time control, modeling & control of a single joint.

UNIT-IV

Nonlinear control of manipulator: Nonlinear, time varying, MIMO systems, control problem for manipulators, practical considerations, Lyapunov stability analysis, criterion based control systems, adaptive control.

TEXT BOOKS:

1. John J. Graig, „Introduction to Robotics: Mechanics & Control‟ International Student Edition, Addison Wesley Reading Massachusetts.

REFERENCE BOOKS:

1. Richard D. Klafter, Et. Al., Robotics Engineering: An integrated approach, „PHI, New Delhi.
2. Ben Zion Saudler, „Robotics Designing the Mechanics for Automated Machinery‟, Prentice Hall, Englewood cliffs.
3. Forden M. Mair, „Industrial Robotics‟ Prentice Hall, New York.

DEMAND SIDE ENERGY MANAGEMENT

MTEEE-518 **Marks**

L	T	P		
4	-	-	Exams	: 100
			Sessionals	: 50
			Total	:150
			Duration of Exam: 3 hrs.	

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-1

Energy Audit : Definitions-Need-concepts-Types of energy audit; Energy Economics: Introduction-Cost benefit risk analysis-Payback period-Straight line depreciation-Sinking fund depreciation—Reducing balance depreciation-Net present value method-Internal rate of return method-Profitability index for benefit cost ratio.

UNIT-II

Energy Conservation in Electric utilities and Industry: Electrical load management: Energy and load management devices-Conservation strategies; conservation in electric utilities and industry: Introduction-Energy conservation in utilities by improving load factor- Utility voltage regulation-Energy conservation in Industries-Power factor improvement.

UNIT-III

Electric Lighting: Introduction-Need for an energy management program-Building analysis-Modification of existing systems-Replacement of existing systems-priorities: Illumination requirement : Task lighting requirements-lighting levels-system modificationsnon illumination modifications-lighting for non-task areas-reflectances-space geometry; System elements.

UNIT IV

Space Heating ,Ventilation, Air-Conditioning(HVAC) and Water Heating: Introduction-Heating of buildings-Transfer of Heat-Space heating methods-Ventilation and air-conditioning-Insulation-Cooling load-Electric water heating systems-Energy conservation methods. Co-generation and storage: Combined cycle cogeneration-energy storage: pumped hydro schemes-compressed air energy storage(CAES)-storage batteries-superconducting magnetic energy storage (SMES)

REFERENCE BOOKS

1. Energy management Hand book by Wayne C.Turner, John Wiley and sons publications
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publiching Company Ltd. New Delhi
3. Energy efficient electric motors selection and application by John C.Andreas
4. Hand book on Energy Audit and Management by Amitkumar Tyagi, published by TERI (Tata Energy Research Institute)
5. Energy management by Paul W.O' Callaghan McGraw Hill Book Company.
6. Energy conversion systems by Rakesh Das Begamudre, New Age International Publishers
7. Energy Management – by W.R.Murphy & G.Mckey Butterworths

OPTIMAL CONTROL THEORY

MTEEE-520

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total :150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Calculus of variation: Fundamental concepts; functionals of a single function; Fundamentals involving several independent functions; Constrained extrema. Pontryagin‟s Minimum Principle : Necessary conditions for optimal control; Linear regulator problems, Pontryagin‟s minimum principle and state inequality constraints; Minimum time problems; Minimum control effort problems.

UNIT-II

Dynamic Programming: The optimal control law; The principle of optimality; Dynamic programming applied to a routing problem; Functional equation of dynamic programming; Recurrence relation of dynamic programming.

UNIT-III

Computational procedure for solving control problems; Characteristics of Dynamic programming solution; Analytical results for discrete Linear regulator problems; The Hamilton-Jacobi-Bellman equation; Continuous Linear regulator problems.

UNIT-IV

Numerical Techniques for finding optimal controls and trajectories: Two point boundary value problems; the method of steepest descent, variation of externals.

TEXT BOOK:

1. Donald E. Kirk, „Optimal Control Theory‟, Pub: Prentice Hall Inc., Englewood Cliffs, New Jersey.

2. Frank. L. Lewis, „Optimal Control‟, John Wiley & Sons.

3. Andrew P. Sage & Chelsea C. White II, „Optimuim? Systems Control‟, Pub: Prentice Hall, Englewood Cliffs, N.J.

ELECTIVE-III

Course No.	Course Title
MTEEE-611	Artificial Neural Network Based Control
MTEEE-613	Smart Grid
MTEEE-615	HVDC Transmission
MTEEE-617	Embedded System Design
MTEEE-619	Modern Control Theory

ARTIFICIAL NEURAL NETWORKS BASED CONTROL

MTEEE-611

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total :150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Introduction & Motivation : Biological neural networks and simple models, Artificial Neuron models, hopfield mets. Multilayer networks – their variants and applications, capacity of multilayer Network, Back propagation.

UNIT-II

Supervised Learning, Linear discriminant functions, unsupervised learning, perceptron learning algorithm.

UNIT-III

Multilayer perceptron, radial – basis function nets, Kohonen‟s self – organizing network, Hopfield networks, The Boltzmann machine, Adaptive resonance theory, Associate of ANN.

UNIT-IV

Applications of ANN to control systems. Process identification, Non-dynamic learning control, inverted Pendulum Neuro Controller.

REFERENCES BOOKS:

1. Artificial Neural Systems – J.M. Zurada.
2. Neural Network for Control – W.T. Miller, R.S. Sattor & P.J. Werbas – MIT, Press (Combridge)
3. Fuzzy Logic and Neural Network Handbook – Chen, Mc-Graw Hill.
4. Neuro Control System – Gupta MM & Rao, IEEE Press.
5. Neural Networks: A comprehensive Foundation – Simon Haykin, Prentice Hall, New Jersy.

SMART GRID

MTEEE-613

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total :150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Concept of smart grid, smart grid control, Communications and Sensing in a Smart Grid, Hardware Architecture, Software architecture, Protocol detail, Discrete control and Analog control, application & benefits, PLCs Vs RTUs, IED's, RTU Block diagram, PMU communication interface, Future trends.

UNIT-II

Cyber Security of the Smart Grid: Smart Grid Threats, Vulnerabilities and Cyber Security Strategies, Cyber Security Environment, False Data Injection and Attacks in Electric Power Grids Cyber-Physical System Security.

UNIT-III

Smart Grid Technologies: Energy Management System, Demand side management: peak clipping, valley filling, load shifting etc. ,state estimation, load forecasting.

UNIT-IV

Distributed Generation & Control: Concept of distribution generation, introduction of various distributed generation sources, e.g. Wind, solar, fuel-cell, micro-hydro, PHEV's etc. Grid integration and control of distributed sources**.**

TEXT BOOKS:

1. T. Gönen, Electric Power Distribution System Engineering, McGraw-Hill, 1986. .
2. Distribution System Protection Manual, McGraw-Edison Power Systems, 1990.
3. Westinghouse Electric Utility Ref. Book, Vol.3, Distribution Systems, 1965.
4. R. E. Brown, Electric Power Distribution Reliability, Marcel Dekker Inc., 2002.

REFERENCE BOOKS:

1. IEEE Power and Energy Magazine, July/August 2007 Issue
2. James Burke, Power Distribution Engineering, Mercel Dekker, 1994. ISBN: 0-8247-9237-8.
3. A.J. Pansini, Electrical Distribution Engineering McGrawHill, 1983.
4. E. Lakervi, E.J.Holmes, Electricity Distribution Network Design, IEE series, 1989.
5. J. Gers and E. J. Holmes Protection of Electricity Distribution Networks 2nd Edition,

HVDC TRANSMISSION

MTEEE-615

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total :150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT I

H.V.D.C. Transmission : General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration. 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 II

Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters. 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 III

Interaction between HV AC and DC systems – Voltage interaction, Harmonic instability problems and DC power modulation. Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control.

UNIT IV

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 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.

EMBEDDED SYSTEM DESIGN

MTEEE-617

L	T	P
4	-	-

Marks

Exams	: 100
Sessionals	: 50
Total	: 150

Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT-I

Introduction: Different types of microprocessors: Embedded micro controllers, external memory microcontrollers; Processor Architectures: Hardvard v/s Princeton, CISC v/s RISC; Microcontrollers memory types; Microcontroller's features: clocking, i/o pins, interrupts, timers, peripherals. Microcontroller Architecture: Introduction to PIC microcontrollers, Architecture and pipelining, Program Memory considerations, Addressing Modes, CPU registers, Instruction set, simple operations.

UNIT-II

Interrupts and I/O ports: Interrupt logic, timer 2 scalar initialization, Int Service interrupt service routine, loop time subroutine, external interrupts and timers, synchronous serial port module, serial peripheral device, O/P Expansion, I/p port expansion, UART.

UNIT-III

Software: Development tools/environmental, Assembly language Programming style, Interpreters, High Level Languages, Intel hex format object files, Debugging. Arithmetic Operations, Bit addressing, Loop control, Stack Operation, subroutines, RAM direct addressing, state machines, Oscillators, Timer interrupts, Memory mapped I/O.

UNIT-IV

Designing Using Microcontrollers: Music Box, Mouse Wheel turning, PWM motor control, Aircraft demonstration, Ultra Sonic Distance Measuring, Temperature Sensor, Pressure Sensor, Magnetic Field Sensor. Introduction to real-time operating system RTOS, RTOS features, Real time operating system programming tools.

TEXT BOOK:

1. Design with PIC Microcontroller by John B. Peatman, Pearson.

REFRENCE BOOKS:

1. Programming KS: and Customizing the 8051 Microcontroller: Predko; TMH.
2. Designing Embedded Hardware: John Catsoulis; SHROFF PUB & DISTR. ND.
3. Programming Embedded Systems in C and C++: Michael Barr; SHROFF PUB & DISTR. ND.

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MODERN CONTROL THEORY

MTEEE-619

L	T	P
4	-	-

Marks

Exams : 100
Sessionals : 50
Total : 150
Duration of Exam: 3 hrs.

NOTE: - Eight Questions are to be set at least two question from each unit and the students will have to attempt any five questions in all.

UNIT- I

Review of matrices and linear vector space including semi-group, group, rings and fields.

UNIT- II

State variable modeling of continuous and discrete time systems; Transformation of state variables; Conversion of state variable models to transfer functions, invariance property; Conversion of Transfer functions to canonical state variable models.

UNIT- III

Linearization of state equations; Solution of state equations of linear time-invariant and time-varying systems.

UNIT- IV

Controllability and observability of dynamical systems. Minimal realization of linear systems and canonical forms. Lyapunov's stability theory for linear dynamical systems.

TEXT BOOKS:

1. M. Gopal, 'Modern Control Theory', Wiley International.

REFERENCE BOOKS:

1. K. Ogata, 'Modern Control Engg', PHI.

2. B.C. Kuo, 'Automatic Control System', PHI.

3. M. Gopal, 'Control Systems – Principles & Design', Tata McGraw-Hill Pub. Co., New Delhi.

MINOR PROJECT

MTEEE-609

L	T	P
-	-	3

Marks

Exams	:	50
Sessionals	:	50
Total	:	100
Duration of Exam:		3 hrs.

The Minor project will consist of identification of the problem, completion of the design work procurement of material, fabrication, implementation and completion of Project Work. At the end of the semester the sessional evaluation of the project work will be done by the panel of faculty members consisting of HOD and participating teachers.

The final evaluation will be done by the external examiner appointed by the university. If the performance of the student will be found unsatisfactory, then he/she shall be instructed for further improvement and shall be evaluated again cited above.

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DISSERTATION

MTEEE-602

L	T	P
-	-	20

Marks

Prac. Exams : 600
Sessionals : 150
Total : 750
Duration of Exam: 3 hrs.

The Dissertation will commence at the start of 4th Semester and will consist of identification of problem completion of design work procurement of material, fabrication and completion of project work.

The award of the sessional will be done by Internal Committee constituted by Head of the Deptt. in different stages. The assessment shall be based on level of work, presentation and reports etc. In case the performance of the student observed unsatisfactory in sessional assessment, he/she may be instructed to improve the dissertation work and present the same before the committee, failing which he/she shall not be allowed to submit the dissertation.

At the end of the semester, every student will be required to submit three bound copies of his/her Master's dissertation to the office of the concerned Department. Out of these, one copy will be kept for department record and one copy shall be for the supervisor. A copy of the dissertation will be sent to the external examiner by mail by the concerned department, after his/her appointment and intimation from the University. Dissertation will be evaluated by a committee of examiners consisting of the Head of the Department, dissertation supervisor(s) and one external examiner. There shall be no requirement of a separate evaluation report on the Masters Dissertation from the external examiner.

The external examiner shall be appointed by the University from a panel of examiners submitted by the respective Head of the Deptt. to the Chairman, Board of Studies. In case the external examiner so appointed by the Univ. does not turn up, the Director/Principal of the concerned college, on the recommendation of the concerned Head of the Deptt. shall be authorized, on behalf of the Univ. to appoint an external examiner from some other institution.

The student will defend his/her dissertation through presentation before this committee and the committee will award either grades/marks. The student whose performance observed unsatisfactory shall be directed to resubmit his/her dissertation after making all corrections/improvements and the dissertation shall be evaluated again as cited above.