MA202 NUMERICAL METHODS

L	T	P	C
3	0	0	3

Course Objectives: To learn numerical methods and apply to engineering problems

Prerequisites: Knowledge of Calculus and Differential Equations

Solution of linear system - Gaussian elimination and Gauss-Jordan methods - LU - decomposition methods - Crout's method - Doolittle method - Cholesky's method - Jacobi and Gauss-Seidel iterative methods - sufficient conditions for convergence - Power method to find the dominant eigen value and eigenvector

Solution of nonlinear equation - Bisection method - Secant method - Regula falsi method - Newton-Raphson method -Order of convergence of these methods - Horner's method - Graeffe's method - Birge-Vieta method - Bairstow's method

Curve fitting - Method of least squares and group averages – Least square approximation of functions - solution of linear difference equations with constant coefficients

Numerical Solution of Ordinary Differential Equations- Euler's method - Euler's modified method - Taylor's method and Runge-Kutta method for simultaneous equations and 2^{nd} order equations - Multistep methods - Milne's and Adams' methods

Numerical solution of Laplace equation and Poisson equation by Liebmann's method - solution of one dimensional heat flow equation - Bender - Schmidt recurrence relation - Crank - Nicolson method - Solution of one dimensional wave equation

Text Books:

1. *Kandasamy, P., Thilagavathy ,K.,and Gunavathy,S., 'Numerical Methods', Chand and Co.,2007.*
2. *Jain, M.K., Iyengar, S.R.,and Jain,R.K., 'Numerical Methods for Scientific and Engineering Computation', Wiley Eastern,1992*

Reference Books:

1. *Gerald,C.F., and Wheatley, P.O., 'Applied Numerical Analysis', M/s. Addison Wesley, 1994.*

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the various methods of solving linear and non-linear equations.
2. Solve ordinary differential equations numerically.
3. Apply the knowledge to real life engineering problems.

EE202 AC MACHINES

L	T	P	C
3	1	0	4

Course Objectives: This course provides a basic understanding of AC machinery fundamentals, machine parts and helps to gain the skills for operating AC machines. The course also equips students with ability to understand and analyse the phasor diagrams and equivalent circuits of AC Induction and Synchronous Machines.

Prerequisites: DC Machines and Transformers

Alternators – construction, principle and types - armature reaction - load characteristics – voltage regulation - two reaction theory.

Synchronous motors - Synchronous machines on infinite bus bars - phasor diagram - V and inverted V curves - current - Hunting and its suppression - starting methods.

Polyphase induction motors - construction, principle and types - equivalent circuit – circle diagram - starting and speed control - Induction generators.

Single phase induction motors - construction, principle and types - double revolving field theory – equivalent circuit.

Permanent magnet brushless motors – construction, principle and types – principle of operation – phasor diagram - torque equation.

Text Books:

1. *Dr. P.S. Bhimbra, 'Electrical Machinery', Khanna Publications, 7th Edition, 2007.*
2. *Nagrath, I.J.and Kothari, D.P., 'Electrical Machines', Tata McGraw Hill Education Private Limited Publishing Company Ltd., 4th Edition, 2010.*
3. *M. G. Say, 'Performance and design of Alternating Current Machines', John Wiley and Sons Publications, 3rd Edition ,1983.*

Reference Books:

1. *Arthur Eugene Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw Hill Education Publications, 6th Edition, 2002.*
2. *Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press- Oxford, 1989.*
3. *Parkar Smith, N.N., 'Problems in Electrical Engineering', CBS Publishers and Distributers, 9th Edition, 1984.*

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

1. Understand the constructional details and principle of operation of AC Induction and Synchronous Machines.
2. Understand and appraise the principle of operation and performance of PMBLDC machines.
3. Analyze the performance of the AC Induction and Synchronous Machines using the phasor diagrams and equivalent circuits.
4. Select appropriate AC machine for any application and appraise its significance

EE204 TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY	**L**	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

- Identify major components of power transmission and distribution systems.
- Describe the principle of operation of transmission and distribution equipment.
- Know and appreciate the key factors in equipment specification and network design.

Prerequisites: Ordinary differential equation , Partial differential equation, Basic of voltage, current, power and elements like R, L & C.

Transmission line parameters – Resistance, Inductance and Capacitance calculations – single phase and three phase lines – double circuit lines – effect of earth on transmission line capacitance

Performance of transmission lines – Regulation and efficiency – Tuned power lines, Power flow through a transmission line – Power circle diagrams, Introduction to Transmission loss and Formation of corona – critical voltages – effect on line performance

Mechanical design of overhead lines – Line supports – Insulators, Voltage distribution in suspension insulators – Testing of insulators – string efficiency – Stress and sag calculation – effects of wind and ice loading

Underground cables – Comparison with overhead line – Types of cables – insulation resistance – potential gradient – capacitance of single core and three core cables

Distribution systems – General aspects – Kelvin's Law – A.C distribution – single phase and three phase – Techniques of voltage control and power factor improvement – Introduction to Distribution loss – Recent trends in transmission and distribution systems

Text Books:

1. *D. P. Kothari and IJ Nagrath, 'Power System Engineering', Tata Mcgraw – Hill, 2nd Edition, 2008.*
2. *Gupta B.R.,' Power system Analysis & Design', S. Chand and Company Ltd., 5th Edition, 2001.*
3. *Singh S N, 'Electric Power Generation Transmission and distribution', PHI India, 2nd Edition,2008*

Reference Books:

1. *Turan Gonen*, '*Electric Power Distribution system Engineering', CRC Press INC, 2nd Edition 2007.*

Useful web links:

1. http://nptel.ac.in/video.php?subjectId=108102047

COURSE OUTCOMES:

Upon completion of this course , students will be able to

1. Understand the major components of Transmission and Distribution Systems (TDS) and its practical significance
2. Good Knowledge of various equipment specifications and design for TDS
3. Awareness of latest technologies in the field of electrical transmission and distribution

EE206 NETWORKS AND LINEAR SYSTEMS

L	T	P	C
3	1	0	4

Course Objectives: To emphasize the relationship between the conceptual understanding and problem-solving approach for (i) analyzing the electric circuit/system excited with non-sinusoidal and non-periodic source,(ii) one-port and two- port networks, (iii) system modeling and simplifications, (iv) transfer function, state- space analysis and z-transform analysis.

Prerequisites: Knowledge on differential and integral calculus, Fourier series, Fourier transform and Laplace transform are essential.

Frequency response-Fourier series-Harmonic analysis of simple circuits – Fourier integral-Fourier transforms – application to simple circuits.

Classification of signals – representation in terms of elementary signals - impulse functions - Time response of circuits - complex frequency - poles and zeros - frequency response from pole- zero configuration– Driving point impedances - two-port networks.

Differential equation for of translational and rotational systems-transfer function modeling for simple electrical and mechanical systems-open loop and closed loop systems - block diagram representation-Block diagram algebra-signal flow graph- Mason's gain formula.

Concepts of state and state variables – state space modeling for simple electrical and mechanical systems – state transition matrix - solution of state equations.

Introduction to discrete time system – difference equations – z-transforms – inverse z-transforms for typical signals – pulse transfer function – solution of difference equation – stability analysis.

Text Books:

1. *D. Roy Choudhury, 'Networks and Systems', New Age International Publications, 1st Edition, 2013.*
2. *James W. Nilsson and Susan A. Riedel, 'Electric Circuits', Pearson Education Publications, 9th Edition, 2011.*
3. *F.F.Kuo,'Network Analysis and Synthesis', John Wiley Inc Publications, 1966*

References:

1. *Cheng.D. K, 'Analysis of Linear System', Addision Wesley Publications, 1988.*
2. *William D. Stanley, 'Network Analysis with Applications', Pearson Education Publications, 2009.*
3. *Hayt, W. H, Kemmerly J. E. & Durbin, 'Engineering Circuit Analysis', McGraw Hill Publications, 8th Edition, 2013.*

COURSE OUTCOMES:

Upon completion of this course, students will

1. Understand the significance of Fourier series and Fourier Transform and apply them for typical electrical systems.
2. Apply Laplace Transform for typical circuits and be able to determine the two-port network parameters.
3. Model the systems in transfer function and state-space domains and analyze the system using these models.
4. Apply Z-transforms for the analysis of discrete time systems.

EE208 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

Course Objectives: To understand the basic operation of different measuring instruments and thereby able to choose appropriate instruments for measuring different parameters.

Prerequisites: Basics of electrical laws and theorems, basic knowhow about operational amplifiers.

Measurements – Errors & classification, Measurement of voltage & current- permanent magnet moving coil and moving iron meters, Digital voltmeters and automation, guarding techniques.

Measurement of power and energy - dynamometer and induction instruments, kVAh and kVARh meters, maximum demand indicators, digital multi-meters. Instrument transformers – Current and Potential transformers. Spectrum Analyzers, Data & Logic Analyzers.

Measurement of resistance, inductance and capacitance using dc and ac bridges, Transducers – Position transducers, force transducers, peizo-electric transducers, Hall effect transducers. Temperature measurement.

Signal sources – Oscillators, Function generator & pulse generators. Oscilloscopes - CRO, Digital storage and Analog storage Oscilloscope, Digital Phosphor Oscilloscopes. Analog & Digital Recorders and printers.

Signal conditioners – Instrumentation amplifiers, voltage – current converters, voltage-frequency converters, analog multiplexers and de-multiplexers. Instruments Used in Computer Controlled Instrumentation, Microprocessor Based Measurements, Case Studies in Instrumentation.

Text Books:

1. *K. Sawhney, 'A Course in Electrical and Electronic Measurements and Instrumentation', Dhanpat Rai & Co., 1st Edition, 2012.*
2. *Bouwens A. J., 'Digital Instrumentation', Tata McGraw Hill Publications, 16th reprint (2008).*
3. *Kalsi H.S, 'Electronic Instrumentation', Tata McGraw-Hill Education, 3rd Edition, 2010.*

References:

1. *Deobelin, 'Measurements Systems', Tata McGraw Hill Publications, 2nd Edition, 2010.*
2. *W. D. Cooper, 'Electronic Instrumentation and Measurement Techniques', Prentice Hall of India Publications, 1st Edition, 2009.*
3. *Rangan C.S., 'Instruments Devices and System', Tata McGraw Hill Publications, 2nd Edition, 2009.*

COURSE OUTCOMES:

Upon completion of the course, the students would be able to

1. Describe the working principle of different measuring instruments.
2. Choose appropriate measuring instruments for measuring various parameters in their laboratory courses.
3. Correlate the significance of different measuring instruments, recorders and oscilloscopes.
4. Develop a micro-processor based measuring unit for any practical application

EE210 ANALOG ELECTRONIC CIRCUITS

L	T	P	C
3	0	0	3

Course Objectives: To give a comprehensive exposure to all types of amplifiers and oscillators constructed with discrete components such as BJTs and FETs. This help to develop a strong basis for building liner and digital integrated circuits.

Prerequisites: Basic knowledge on electronic devices and circuit theory

Small signal amplifiers - biasing circuits of BJT and FET transistors, analysis and design of BJT and FET amplifiers, chopper stabilized amplifiers

Large signal amplifiers – analysis and design of class A and class B power amplifiers, class C and class D amplifiers, thermal considerations, tuned amplifiers

Feedback amplifiers – gain with feedback - effect of feedback on gain stability, distortion, bandwidth, input and output impedances ; topologies of feedback amplifiers

Oscillators – Barkhausen criterion for oscillation - Hartley & Colpitts oscillators - phase shift, Wien bridge and crystal oscillators - 1lap oscillator – oscillator amplitude stabilization

Pulse circuits – attenuators – RC integrator and differentiator circuits – diode clampers and clippers – multivibrators - Schmitt Trigger- UJT Oscillator

Text Books:

1. *Jacob Millman, 'Micro electronics', McGraw Hill, 2nd Edition, reprinted 2009.*
2. *David A bell, 'Fundamentals of electronic devices and circuits', Oxford University Press, Incorporated, 25-Jun-2009.*
3. *Thomas L. Floyd, David M. Buchla, 'Electronic Fundamentals', Pearson Prentice Hall, 7th Edition, 2010.*

Reference Books:

1. *Allen Mottershead, 'Electronic Devices and Circuits-An Introduction', PHI, 18th Reprint, 2006.*
2. *Robert.L.Boylestad, 'Electronic Devices and Circuit Theory', Pearson, 10th Edition, 2009.*
3. *Sedra Smith, 'Microelectronic Circuits', Oxford university Press, 6th Edition, 2010.*

COURSE OUTCOMES:

Upon completion of this course , students will be able to

1. Understand the working of different types of amplifier, oscillator and multivibrator circuits.
2. Design BJT and FET amplifier and oscillator circuits.
3. Analyze transistorized amplifier and oscillator circuits.
4. Understand the applications of different types of amplifier, oscillator, attenuators and multivibrator circuits.

EE212 SYNCHRONOUS AND INDUCTION MACHINES LABORATORY

L	T	P	C
0	0	3	2

Course Objectives: The main objective of the course is to give the students an insight into the constructional details of the induction and synchronous machines with a view of better understanding of their working principles. The course also equips the students to test and evaluate the performance of induction and synchronous machines by conducting appropriate experiments

Prerequisites: Basic knowledge in electric circuit analysis, constructional details and operational principles of induction and synchronous machines.

List of Experiments

A demonstration of the static and rotational electrical machines (constructional details) is ought to be done in an introductory class.

1. Load test on 3 phase induction motor
2. No load and blocked rotor test on 3 phase induction motor
3. Load test on grid connected induction generator
4. Load test on self-excited induction generator
5. Load test on single phase induction motor
6. Regulation of three phase alternator by E.M.F and M.M.F methods
7. Load test on three phase alternator
8. Synchronisation of three phase alternator with infinite bus bar
9. V and inverted V-curves of synchronous motor
10. Speed Control on three phase induction motor

Mini project

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

1. Estimate or test the performance of induction and synchronous machines by conducting suitable experiments and report the results.
2. Experiment and analyze the speed control techniques for three phase induction motors.
3. Evaluate the different modes of operating the induction generators and justify their usage in wind power generation.
4. Experiment synchronization of alternators and power exchange with the grid to get convinced with their usage at conventional power generation stations
5. Develop simulation models and prototype modules in view of implementing any control technique upon single phase and three phase induction motors for various applications

EE214 ELECTRONIC CIRCUITS LABORATORY

L	T	P	C
0	0	3	2

Course Objectives: Design of amplifiers and other electronic systems to satisfy specifications .Gain, Bandwidth, Feedback and Stability are some of the design concepts needed.

Prerequisites: Electron Devices, Electronic Circuits, Circuits and Devices Laboratory.

List of Experiments

1. Frequency analysis of Common emitter amplifier
2. Measurement of input/output impedance of Common collector amplifier
3. Design and verification of characteristics of RC oscillators
4. Design and characterisation of Monostable multivibrator
5. Design and Characterisation of Astable multivibrator
6. Characteristics of UJT and applications of UJT oscillator
7. Frequency analysis of FET Amplifier
8. Frequency response of series voltage negative feedback Amplifier
9. Square waveform generation using transistor based Schmitt trigger
10. Design and characterisation of Bistable Multivibrator

Mini -Project

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

1. Design a complete electronic circuit using a top-down approach which starts from specifications.
2. Design and analyze electronic circuits using BJT and FET.
3. Design and characterization of electronic circuits using UJT.
4. Waveform generation circuit design using electronic devices.
5. Prepare the technical report and provide solutions to real time problems.