EN010 401 Engineering Mathematics III

(Common to all branches)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives: *Apply standard methods of mathematical &statistical analysis*

MODULE 1 Fourier series (12 hours)

Dirichlet conditions – Fourier series with period 2 π and 2l – Half range sine and cosine series – Harmonic Analysis – r.m.s Value

MODULE 2 Fourier Transform (12 hours)

Statement of Fourier integral theorem – Fourier transforms – derivative of transforms- convolution theorem (no proof) – Parsevals identity

MODULE 3 Partial differential equations (12 hours)

Formation by eliminating arbitrary constants and arbitrary functions – solution of Lagrange's equation – Charpits method –solution of Homogeneous partical differential equations with constant coefficients

MODULE 4 Probability distribution (12 hours)

Concept of random variable , probability distribution – Bernoulli's trial – Discrete distribution – Binomial distribution – its mean and variance- fitting of Binominal distribution – Poisson distribution as a limiting case of Binominal distribution – its mean and variance – fitting of Poisson distribution – continuous distribution- Uniform distribution – exponential distribution – its mean and variance – Normal distribution – Standard normal curve- its properties

MODULE 5 Testing of hypothesis (12 hours)

Populations and Samples – Hypothesis – level of significance – type I and type II error – Large samples tests – test of significance for single proportion, difference of proportion, single mean, difference of mean – chi –square test for variance- F test for equality of variances for small samples

References

1. Bali& Iyengar – A text books of Engg. Mathematics – Laxmi Publications Ltd.
2. M.K. Venkataraman – Engg. Mathematics vol II 3rd year part A & B – National Publishing Co.
3. I.N. Sneddon – Elements of partial differential equations – Mc Graw Hill
4. B.V. Ramana – Higher Engg. Mathematics – Mc Graw Hill
5. Richard A Johnson – Miller Fread's probability & Statistics for Engineers- Pearson/ PHI

6. T. Veerarajan – Engg. Mathematics – Mc Graw Hill
7. G. Haribaskaran – Probability, Queueing theory and reliability Engg. – Laxmi Publications
8. V. Sundarapandian - probability ,Statistics and Queueing theory – PHI
9. H.C.Taneja – Advanced Engg. Mathematics Vol II – I.K.International
10. A.K.Mukhopadhyay-Mathematical Methods For Engineers and Physicists-I.K.International

EE 010 402 DC Machines and Transformers

Teaching scheme **Credits: 4**
3 hours lecture and 1 hour tutorial per week

Objectives

- *Understanding the basic working principles of DC machines and Transformers*
- *Analysing the performance of DC machines and Transformers*

Module I (10 hours)
DC Machines: Constructional features – principle of operation of DC generator - armature winding - types - e.m.f. equation - armature reaction – effects of armature reaction - demagnetizing and cross magnetizing ampere- turns - compensating winding - commutation – methods to improve commutation – e.m.f. in coil undergoing commutation – reactance e.m.f.- effect of brush shift- inter poles.

Module II (12 hours)
DC Generator: Types of excitation – separately excited- self excited shunt, series and compound machines – the magnetization curve – condition for self excitation- field critical resistance- critical speed- load characteristics of generators – load critical resistance – voltage regulation - parallel operation of shunt, series and compound generators – power flow diagram- losses and efficiency- condition for maximum efficiency- applications.

Module III (15 hours)
DC Motors: principle of operation of DC motor – developed torque - performance characteristics and operating characteristics of shunt, series and compound motors.
Starting – three point and four point starters – design of starter resistance for shunt motor - methods of speed control of shunt , series and compound motors – solid state speed control (block diagram) – power flow diagram- losses and efficiency- testing of D C machines – Swinburne's test - Hopkinson's test - Field's test – retardation test- applications

Module IV (14 hours)
Single Phase transformers: Principle of operation - constructional details - e.m.f equation - operation on no load - magnetizing current wave form - load operation - phasor diagram - equivalent circuit – per unit impedance - losses and efficiency - condition for maximum efficiency – voltage regulation- approximate expression for voltage regulation- harmonics in single phase transformers - OC and SC tests - Sumpner's tests - parallel operation – applications.

Module V (9 hours)
Three phase transformers: Constructional details- choice of transformer connections- Scott connection (three phase to two phase only) - oscillating neutral- tertiary winding - vector groups- equivalent circuits- tap changing transformers- no load tap changing – on load tap changing- cooling of transformers.
Distribution transformers- all day efficiency- auto transformers- saving of copper- applications.

Text Books

1. Dr. P S Bimbhra, *Electrical Machinery*, Khanna Publishers
2. Clayton and Hancock, *The Performance and design of DC Machines*, ELBS/CBS Publishers,Delhi

Reference Books

1. Alexander Langsdorf A S, *Theory of AC Machinery*, Tata McGraw-Hill
2. J B Gupta, *Electrical Machines* , S K Kataria and Son
3. Fitzgerald, Kingsley, Electric machinery, 6e, Tata McGraw – Hill Education, New Delhi, 2003
4. Say M G, *Performance and design of AC Machines*, ELBS
5. Nagarath I J and Kothari D P, *Electrical Machines* ,4e, Tata McGraw- Hill Education, New Delhi, 2010
6. Vincent Deltoro, *Electrical Machines and Power System*, Prentice Hall

EE 010 403: Linear System Analysis

Teaching scheme **Credits: 4**

2 hours lecture and 2 hours tutorial per week

Objectives

- *To Provide sound knowledge in the analysis of linear time invariant continuous systems*

Module 1(12 Hrs)

Review of system concepts –classification of systems- linear, non - linear, static, dynamic, time variant and time invariant, continuous time and discrete time, distributed and lumped parameter systems. Open loop and closed loop systems. Transfer function of linear systems. Mathematical modelling of electrical systems, operational amplifier circuits, Mechanical translational and rotational systems, electromechanical systems, linearization of nonlinear models.

Module 2(12 Hrs)

Block diagram representation of systems-Block diagram reduction. Signal flow graph-signal flow graph from equations. Maison's gain formula. Construction of Signal flow graph from Block diagram and vice –versa. Modelling in State Space-state space- representation of dynamic systems.

Module 3(12Hrs)

Effect of parameter variation in open loop control systems, closed loop control systems, sensitivity, gain and stability.

Time domain analysis for linear systems-response to standard inputs-type and order of a system-response of first order system to unit step, unit ramp and unit impulse signals-step response of second order systems-time domain specifications.

Error analysis - steady state error and error constants- Dynamic error coefficients.

Module 4(12Hrs)

Concept of stability, BIBO stability. Effect of location of poles on stability. Routh- Hurwitz criterion. Relative stability analysis. Root locus- effect of addition of poles and zeros on root locus. Analysis of stability by Lyapunov's Direct method – Concept of definiteness-Liapunov's stability theorem, Sylvester's theorem.

Module 5(12Hrs)

Network functions-network function for two port –pole and zeroes of network functions-restriction on poles and zeroes for driving point functions and transfer functions-characterization of two port networks in terms of impedance' admittance-hybrid and transmission parameters –inter-relationship among parameter sets-inter connection of two port networks-series, parallel and cascade-ideal two port devices- ideal transformer –Gyrator-negative impedance converter.

Text Books:

1. David .k. Cheng , *Analysis of linear systems* ,Oxford
2. M. Gopal, *Control Systems Principles and Design,-For Linear System Analysis & Control System,* 3e,Tata McGraw Hill Education ,2008
3. Samarajit Ghosh, *Network Theory, Analysis and Synthesis,* PHI, New Delhi

Reference Books

1. S. Hassan Saeed , *Automatic Control Systems* , Katson Books
2. Katsuhiko Ogatta, *Modern control engineering* , Pearson Education
3. Dr. S. Palani, *Control Systems Engineering,* 2e, Tata McGraw-Hill Education,2009
4. Richard C. Dorf and Robert H. Bishop, *Modern control systems,* Pearson Education
5. Franklin, Powell-*Feedback controlof dynamic systems,* Pearson Education
6. C.T. Chen , *Linear system theorey and design* .
7. D.Roy Choudhry , *Modern Control Engineering*-, PHI
8. Burton T.P, *Introduction to dynamic systems*.

EE 010 404: Electromagnetic Theory

Teaching scheme **Credits: 4**
3 hours lecture and 1 hour tutorial per week

Objectives

To impart knowledge on

- *basic concepts and principles of electromagnetic fields*
- *practical significance of the theory to develop a clear perspective for appreciating engineering applications .*

Module I (15 hours)
Review of Vector Analysis - Cartesian coordinate system - The Vector field- dot and cross products - introduction to cylindrical and spherical coordinate systems.
Static Electric Field: Coulomb's law - electric field intensity -field intensity due to point charge, line charge and volume charge distributions- electric flux- electric flux density- Gauss's law and its applications- divergence of a vector –curl of a vector - Maxwell's first equation- the Del operator- Divergence theorem

Module II (12 hours)
Energy and potential - Energy expended in moving a point charge in an electric field - Electric Potential between two points – potential at any point due to a point charge - potential at any point due to discrete as well as distributed charges- Electrical field lines and equipotential contours –electric dipoles - dipole moment - potential gradient- conservative nature of a field- Laplace and Poisson equations (Derivation only and not solution) – Maxwell's Curl equation for electrostatic fields.

Module III (11 hours)
Conductors and Dielectrics– current and current density- continuity equation- -point form of Ohm's law- conductor properties – polarization - dielectric strength and break down - dielectric boundary conditions
Capacitance - parallel plate capacitor - capacitance of isolated sphere, spherical shell, coaxial cylinders and parallel wires - effect of earth on capacitance - method of images – capacitors in series and parallel – energy stored in static electric field

Module IV (12 hours)
The steady Magnetic Field - Biot-Savart's law - Ampere's circuital law – H due to a long wire - H due to a long solenoid - H due to an infinite current sheet - H due to a circular wire loop - Stoke's theorem - magnetic flux and flux density – Maxwell's equations for magnetostatic fields - the scalar and vector magnetic potentials - magnetic force on a moving charge - force on a current element - force between current carrying wires - torque on closed circuits - magnetic boundary conditions, energy stored in a magnetic field, skin effect.
Self and mutual inductances –Inductance of solenoids, torroids and two wire transmission lines– inductances in series and parallel.

Module V (10 hours)
Time varying fields- Faraday's laws of electromagnetic induction- Motional emf - concept of displacement current- Maxwell's equation in point form and integral form.

Wave equation in free space – applications in transmission lines - power flow and Poynting vector - Poynting theorem- interpretations- instantaneous, average and complex pointing vector- power loss in conductors.

Numerical methods in electromagnetics (overview only).

Text Books

1. Mathew N O Sadiku, *Principles of Electromagnetics*, Oxford University Press
2. T V S Arun Murthy, *Electromagnetic Fields*, S. Chand

Reference Books

1. W H Hayt, J A Buck, *Engineering Electromagnetics*, Mc Graw Hill
2. John D Kraus, *Electromagnetic*., Mc Graw Hill
3. Guru and Hiziroglu, *Electromagnetic Field Theory Fundamentals*, Cambridge University Press
4. Fawwaz T Ulaby, *Electromagnetics for Engineers*, Pearson education
5. Gangadhar KA, *Field Theory*, Khanna Publishers
6. David K Cheng, *Field and Wave Electromagnetics*, Pearson education

EE 010 405: Digital Systems and Computer Organisation

Teaching scheme **Credits: 4**
3 hours lecture and 1 hour tutorial per week

Objectives

- *To provide insight into design of Digital systems and Digital computer system components and their organizational aspects.*
- *To provide a foundation for the advanced courses like Microprocessor Systems, Microcontrollers & Embedded systems and Computer related elective courses.*

Module 1 (12 hours)
Combinational Digital Circuits: Logic operations and Gates- De Morgan's Theorem - Realization of combinational circuits using SOP and POS forms - K-map up to 4 variables. Decoders: BCD to decimal, BCD to 7-segment - Encoders- Multiplexer- Demultiplexer.
Logic Families: TTL and CMOS families- TTL NAND gate internal circuit- TTL characteristics- sinking and sourcing- fan-in and fan-out – CMOS characteristics – CMOS NAND and NOR gates.

Module 2 (11 hours)
Sequential Circuits: Flip-Flops- SR, JK, T and D flip-flops- JK master-slave FF. Truth table and excitation table- conversion of flip-flops from one type to another.
Asynchronous counters: Ripple counter- disadvantages-Decoding errors– modulo N ripple counter using CLEAR and PRESET inputs. Asynchronous UP - DOWN counter.

Module 3 (13 hours)
Synchronous Counters: Synchronous counter design – modulo N counter design for completely specified count sequence – lockout- design without lockout – Synchronous UP/DOWN counters..
Shift Registers: SISO, SIPO, PISO, PIPO types -Universal shift register.
Counters using Shift Registers: Ring counter – twisted ring counter.

Module 4 (13 hours)
Computer Organisation
Processor Organization –Block diagram of a processor - typical operation cycle: fetch, decode and execute — processor bus structures.
Arithmetic and Logic unit: Adders- Half adder, full adder circuits. half subtraction and full subtraction circuits. serial and parallel adders- fast adders- carry look ahead adder- 2's complement adder / subtractor- design of Logic unit- one stage ALU.

Module 5 (11 hours)
Memory Organisation: Memory hierarchy- Semiconductor RAM – typical static RAM cell – Dynamic RAM cell- Internal organization of memory chips -ROM – PROM – EPROM – E^2PROM – Flash Memory. Cache memory – Hit and miss – cache mapping functions — memory interleaving — virtual memory organization – Address translation.
Input/Output Organisation: Buses- Single bus structure-I/O interfacing- Standard I/O interfaces: PCI, SCSI and USB (block diagram description only)

Text Books:

1. Anandkumar, *Fundamentals of digital circuits*, PHI
2. V. Hamacher, *Computer Organisation*, Mc Graw Hill

References:

1. Thomas L. Floyd , *Digital Fundamentals*, Pearson Education
2. Malvino & Leach, *Digital Principles and Applications*, TMH
3. Taub & Schilling, *Digital Integrated Electronics*, McGraw Hill Intl.
4. Salivahanan, *Digital circuits & design*, Vikas
5. M.Morris Mano, *Logic and Computer Design Fundamentals*:, 2/e Pearson
6. P. Pal Chaudhari , *Computer Organisation and Design*, PHI

EE 010 406: Computer Programming

Teaching scheme **Credits: 4**
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the concepts of structured programming.*
- *To develop programming skill in students*

Module 1 (10 hours)
Introduction to C: Steps in executing a C program – C Tokens- C character set – identifiers and keywords – data types – constants and variables – declarations – type casting - operators – expressions – statements – special operators: comma and sizeof operators- library input-output functions.
Branching control statements: if, if-else, nested if-else, switch, goto statements – conditional operators.

Module 2 (14 hours)
Looping control statements : 'while', 'do-while', 'for' statements – nested loops, break and continue statements.
Arrays: single dimensional arrays — declaring and initializing arrays- searching & sorting in arrays.
Strings: Declaration – initialization.
Multidimensional arrays -declaration – initialization - matrix operations – addition, transpose and multiplication.

Module 3 (13 hours)
Functions: Declaration, definition and access – passing arguments to a function – pass by value and pass by reference – recursion- - passing arrays to a function — string handling functions – comparison, concatenation and sorting of strings.
Storage classes: automatic variables – external variables – register variables – scope and life time of variables.
Pointers: Concept of pointers– pointer declaration – operations on pointers-pointers as function arguments.

Module 4 (12 hours)
Structures and union: definition – declaration of structure variables- initialization – accessing structure members – array of structures – passing structure to a function – sorting of structures — union.
Dynamic memory allocation – self referential structures – basic concepts of linked lists.

Module 5 (11 hours)
Files: File pointers – data files: text mode & binary mode – file operations- opening and closing – reading and writing- file handling functions.
Command line arguments – macros – C pre processor

Text books:

1. Balagurusamy, *Programming in ANSI C* , TMH
2. K.R. Venugopal and S.R. Prasad, *Mastering C* , TMH

Reference Books

1. Kernighannn & Ritchie, *The C programming language*, Pearson Education, Asia
2. Mullish & Cooper, *The Spirit of C, An Introduction to modern programming*,, Jaico Publishing Co.
3. Yashwant Kanetkar, *Let us C*, BPB publ.
4. Byron S. Gottfried, *Programming with C*, Schaum Outlines –,McGraw Hill.
5. Ashok Kamthane, *Programming with ANSI & Turbo C*-, Pearson Education Asia

EE 010 407 Computer Programming Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To develop computer programming skills*

Programming Experiments in C

Programming experience in C to cover control structures, functions, arrays, structures, pointers and files in accordance with syllabus of EE 010 406.

1. Familiarization using simple programs.
2. Familiarization of branching and looping operations
3. Summation of series
4. Preparation of Conversion tables
5. Solution of quadratic equations
6. Array manipulation
7. Functions
8. Recursive functions
9. Matrix operations
10. String manipulation – compare, copy, reverse operations
11. Pointers- Sorting of single dimensional arrays and strings
12. Structures - sorting
13. Tabulation of marks and declaration of results – input and output using files
14. Creation of numeric and text files, merging and appending of files.
15. Simple programs using linked lists

References:

1. Balagurusamy, *Programming in ANSI C*, TMH
2. K.R. Venugopal & S.R. Prasad, *Mastering C* , TMH

EE 010 408: Electronic Circuits Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

To expose the students to a variety of practical electronic circuits to prove the theories behind them.

1. Diode Characteristics
2. BJT, FET and UJT characteristics.
3. Design and testing of clipping and clamping circuits
4. Design and testing of RC integrator and differentiator circuits.
5. Design and testing of rectifier circuits – Half wave – Full wave (centre – tapped and bridge) circuits. Filter circuits.
6. Design and testing of Zener Shunt and Transistor Series Voltage Regulator.
7. Design and testing of RC coupled amplifier– frequency response.
8. Design and testing of Feedback amplifiers.
9. Design and testing of FET amplifier.
10. Sweep circuits – UJT and BJT based sweep generators – sweep circuit using constant current source (BJT).
11. Design and Testing of RC phase-shift Oscillator and LC Oscillator.
12. Design and Testing of Astable and Bi-stable Multi-vibrators.
13. Relay driving circuit using transistors.

Optional

Simulation of the above circuits using EDA tools like PSPICE.
(Any experiment relevant to **EE 010 305** may be added)

References

1. A.P. Malvino, *Electronic Principles*– TMH
2. Floyd, *Electronic Devices*, Pearson Education, LPE
3. Robert L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuit Theory*, Pearson Education Asia, LPE.
4. Navas, *Electronic Circuits Lab Manual*