EN010501A ENGINEERING MATHEMATICS IV

(Common to all branches except CS & IT)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives: *Use basic numerical techniques to solve problems and provide scientific techniques to decision making problems.*

MODULE 1 Function of Complex variable (12 hours)

Analytic functions – Derivation of C.R. equations in cartision co-ordinates – harmonic and orthogonal properties – construction of analytic function given real or imaginary parts – complex potential – conformal mapping of z^2 , $\frac{1}{z}$ - Bilinear transformation – cross ratio – invariant property (no proof) – simple problems

MODULE 2 Complex integration (12 hours)

Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's series- Laurent's series – Zeros and singularities – types of singularities – Residues – Residue theorem – evaluation of real integrals in unit circle – contour integral in semi circle when poles lie on imaginary axis.

MODULE 3 Numerical solution of algebraic and transcendental equations (10 hours)

Successive bisection method – Regula –falsi method – Newton –Raphson method - Secant method – solution of system of linear equation by Gauss – Seidel method

MODULE 4 Numerical solution of Ordinary differential equations (10 hours)

Taylor's series method – Euler's method – modified Euler's method – Runge – Kutta method (IV order) - Milnes predictor – corrector method

MODULE 5 Linear programming problem (16 hours)

Definition of L.P.P., solution, optimal solution, degenerate solution – graphical solution –solution using simplex method (non degenerate case only) Big -M method – Duality in L.P.P. – Transportation problem –Balanced T.P. – initial solution using Vogel's approximation method - modi method (non degenerate case only)

References

1. B.V. Ramana – Higher Engg. Mathematics – Mc Graw Hill
2. M.R.Spicgel , S.Lipschutz , John J. Schiller, D.Spellman – Complex variables, schanm's outline series - Mc Graw Hill
3. S.Bathul – text book of Engg.Mathematics – Special functions and complex variables –PHI
4. B.S. Grewal – Numerical methods in Engg. and science - Khanna Publishers
5. Dr.M.K Venkataraman- Numerical methods in science and Engg -National publishing co

6. S.S Sastry - Introductory methods of Numerical Analysis -PHI
7. P.K.Gupta and D.S. Hira – Operations Research – S.Chand
8. Panneer Selvam– Operations Research – PHI
9. H.C.Taneja – Advanced Engg. Mathematics Vol II – I.K.International

EN010 502(ME): Principles of Management

(Common with EN010 402(ME))

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To develop an understanding of different functional areas of management.*
- *To understand the functions and duties an individual should perform in an organisation.*

Module I (12 hours)

Management Concepts: Vision, Mission, Goals and Objectives of management-MBO-Scientific management- Functions of management- Planning- Organizing- Staffing-Directing- Motivating- Communicating- Coordinating- Controlling- Authority and Responsibility- Delegation- Span of control- Organizational structure- Line, Line and staff and Functional relationship.

Module II (12 hours)

Personnel Management: Definition and concept- Objectives of personnel management-Manpower planning- Recruitment and Selection of manpower- Training and development of manpower- Labour welfare- Labour turnover- Quality circle- Industrial fatigue- Industrial disputes-Method of settling disputes- Trade unions.

Module III (12 hours)

Production management: Objectives and scope of production management- Functions of production department- production management frame work- product life cycle-Types of production- Production procedure- Project planning with CPM and PERT- Basic concepts in network.

Module IV (12 hours)

Financial Management: Objectives and Functions of Financial Management- Types of Capital- Factors affecting working capital- Methods of financing.
Cost Management: Elements of cost- Components of cost- Selling Price of a product.

Module V (12 hours)

Sales and Marketing Management: Sales management- Concept- Functions of sales department- Duties of sales engineer- Selling concept and Marketing concept- Marketing-Definition and principles of marketing- Marketing management and its functions- Sales forecasting- Pricing- Advertising- Sales promotion- Channels of distribution- Market research.

Text Books

1. Koontz and Weihrich, *Essentials of Management*, Tata McGraw Hill.
2. Mahajan M., *Industrial Engineering and Production Management*, Dhanpat Rai and Co.
3. Kemthose and Deepak, *Industrial Engineering an Management*, Prentice Hall of India.

Reference Books

1. Martand Telsang, *Industrial Engineering and Production Management.*
2. Khanna O.P., *Industrial Engineering and Management*, Dhanpat Rai and Co.
3. Philip Kotler, *Marketing Management*, Prentice Hall of India.
4. Sharma S. C. & Banga T. R., *Industrial Organisation and Engineering Economics*, Khanna Publishers.
5. Prasanna Chandra, *Financial Management*, Tata McGraw Hill.

EE 010 503 Signals and Systems

Teaching scheme **Credits: 4**
2 hours lecture and 2 hour tutorial per week

Objectives

- *To understand different types of signals and systems*
- *To provide sound knowledge in different transforms in the analysis of signals and systems*

Module 1 (12hrs)
Signals- Classification of signals Basic operations on signals. Representation of a wave as sum of elementary functions. - Systems-Classification of systems.
Fourier series analysis of continuous time periodic signals-Fourier coefficients, exponential Fourier series, properties of continuous time Fourier series, power representation using Fourier series, Fourier spectrum. Steady state solution of electric circuits with non- sinusoidal non periodic input by Fourier series.

Module 2 (12hrs)
Fourier Transform- Fourier transform of standard signals, properties of Fourier transform, Amplitude and phase spectrum, Fourier Transform of periodic signals. . Inverse Fourier transform for a given spectra. System analysis with Fourier Transform-Transfer function of LTI system. Signal transmission through linear system-signal distortion-Signal band width and system bandwidth-band width and rise time, band width requirement for signal transmission.

Module 3 (12hrs)
Convolution and correlation of signals- Convolution theorems, Power spectral density and energy spectral density. Comparison of ESD and PSD, cross correlation of energy and power signals. Auto correlation-Auto correlation for energy signals, periodic signals, auto correlation and spectral density, relationship between convolution and correlation, Detection of periodic signals in presence of noise by correlation.

Module 4 (12hrs)
Sampling theory- Sampling theorem, nyquist rate, reconstruction of signal, effects of under sampling, sampling of band pass signals, sampling techniques, comparison of various sampling methods. Time domain analysis of discrete time system- solution of difference equation, natural and forced response. Impulse response and convolution-convolution of two sequences, Causality ,FIR and IIR systems, Stability, Step response, Correlation of two sequences. Inverse system and Deconvolution.

Module 5 (12hrs)
Symmetrical two port network-image impedance –characteristics impedance-and propagation constant of a symmetrical two port network-properties of symmetrical two port network - symmetrical two port network as a filter- filter fundamentals-pass and stop bands-behaviour of iterative impedance- constant –k, low pass, high pass and band pass filters- m derived T and ∏ sections and their applications for finite attenuation at filter terminals – band pass and band elimination filters

Text Books:

1. Alan V Openhein and Schafer, S*ignals and Systems*, Pearson.
2. Ravikumar , *Signals and Systems* ,PHI
3. Dr. S. Palani, Signals and Systems, Ane Books Pvt. Ltd. First Edition, 2009

References

1. Luis F Chapparo, *Signals and systems*; Elsevier Publications,2011
2. Roberts, *Fundamentals of Signals and Systems* (SIE), 2e, Tata McGraw –Hill Education New Delhi,2010
3. D.C. Dhubkarya , *Networks and Systems*, University Press, New Delhi,2008.
4. P.Ramesh Babu and R. Ananda Natarajan, ,*Signals and systems*, SCITECH
5. Simon Haykin and Barry Van Veen , *Signals and Systems*, Second Edn,John Wiley,India ,2010.
6. Robert A. Gabel and Richard A. Robert, *Signals and Systems*, Wiley, India
7. D.Ganesh Rao, R.V. Srinivasa Murthy, *Network Analysis, A Simplied Approach* Sanguine Technical Publishers.

EE 010 504: Power Electronics

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

Objectives

To understand the characteristics and operational features of important power electronic devices and circuit topologies that are useful in applications demanding high energy efficiency and compact power conversion stages

Module 1 (17 hours)
Static switches: Uncontrolled and controlled switches. Directional voltage and current properties. Loss calculation and selection of heat sink, Snubbers. Power diodes - reverse recovery characteristics and its effects, Current and Voltage ratings. Power Transistors, Power Darlingtons, Power MOSFETS, IGBTs- Principle of operation, Static and Dynamic Performance, Safe operating area, Drive circuits.

SCRs- Static and dynamic characteristics, two transistor analogy, ratings and specifications, Device protection, Gate circuit requirements, timing control and firing of thyristors, amplification and isolation of SCR gate pulses, Timing and synchronization, R, RC, UJT based firing, Diac based triggering circuit for TRIAC, Firing circuits incorporating pulse transformers and opto couplers, Single pulse and multi pulse triggering.

Module 2 (15 hours)
Phase controlled rectifiers: single phase half wave controlled rectifier circuit – single phase full wave controlled rectifier circuit – R, RL Loads – free wheeling – half controlled and fully controlled bridge with continuous current – Expression for output voltage – wave forms – active and reactive power – Line current distortion, displacement power factor and distortion factor, THD, effect of source inductance – line commutated inverter . Generation of gate timing pulses for single phase controlled rectifiers. 3-phase half wave and full wave controlled rectifier – expression for output voltage.

Module 3 (10 hours)
Choppers and cyclo converters: Voltage step down chopper- Power circuit configuration and working principle, Voltage and current relationships. Choice of filter inductance and/frequency. Voltage step up chopper- Basic principle of operation, Two quadrant and four quadrant choppers (Analysis not required). Generation of timing pulses for a single phase chopper. Voltage and current commutation.
Basic Principle of Cyclo converters: single phase and three phase. (Analysis not required).

Module 4 (10 hours)
Inverters: Types of Inverters-Voltage source inverters, Current Source inverters - Half bridge inverter-analysis with inductive load. Full bridge inverter- adjustment of ac frequency and ac voltage, Harmonic analysis - Principle of Sinusoidal PWM- Unipolar and Bipolar schemes - Three phase VSI-circuit configuration and switching sequence, square wave mode of operation, phase and line voltage waveforms, Sine triangle PWM.

Module 5 (8 hours)
Switch Mode Power Supply Systems: Switch mode regulators- Buck, Boost and Buck boost topologies- voltage and current relationships- output voltage ripple. Isolated converters (Analysis not required) Forward, fly back, push pull, half bridge and full bridge converters- basic principle of operation.

Text Books

1. Joseph Vithayathil, *Power Electronics-Principles and applications*, TMH, 2010
2. M.H. Rashid , *Power Electronics – Circuits, Devices and Applications*, PHI/Pearson 2005

Reference Books

1. Mohan, Undeland, Robins, *Power Electronics- Converters, Applications and Design*, 3rd Edition, John Wiley India, 2003.
2. M. S. Jamil Asghar, *Power Electronics*, PHI, 2009.
3. M. D. Singh, K.B Kanchandani, *Power Electronics*, TMH-2007
4. Philip T Krein, *Elements of Power Electronics*, Oxford University Press, 2008.
5. Jai P. Agrawal , *Power Electronic Systems – Theory and Design*, Pearson Education Asia, LPE, 2002
6. 6. L. Umanand, *Power Electronics- Essentials and Applications*, Wiley India 2009

EE 010 505: Linear Integrated Circuits

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

Objectives

- *To impart the basic concepts of operational amplifiers and applications.*
- *To develop the student's ability to design and analyze a wide variety of Linear Integrated circuits.*

Module 1 (14 hrs)

Operational Amplifiers: Differential amplifier-current mirror- block diagram of a typical op amp- characteristics of an ideal op-amp-definitions of CMRR -slew rate- input offset voltage - differential input resistance-input voltage range - SVRR - large signal voltage gain - output voltage swing - output resistance – single voltage biasing - open loop configurations - disadvantages-closed loop configurations –offset compensation-offset minimizing resistor-non inverting amplifier - voltage follower-inverting amplifier - summing and scaling amplifier - integrator -differentiator- V to I and I to V converter-log and antilog amplifier **.**

Module 2 (10 hrs)
Basic comparator- Astable multivibrator – mono stable multivibrator – Triangular wave generator-schmitt trigger - zero crossing detector - precision rectifier - peak detector - sample and hold circuit-RC Phase Shift Oscillator- Pulse width controller , voltage limiter. Function generator 8038.

Module 3 (12 hrs)

Active Filters - low pass filter, high pass filter, band pass filter, band reject filter (first and second order). D/A converter-binary weighted resistor type -ladder type.-DAC 0808- A/D converter – simultaneous (flash) A/D converter - counter type - successive approximation converter – sigma delta converter - dual slope converter -Digital voltmeter–ADC 0800

Module 4 (13 hrs)

Phase locked loop - basic principles of PLL –VCO, NE 566- block diagram - transfer characteristics –PLL NE 565- applications of PLL as frequency multiplier, frequency translator, AM demodulator, FM demodulator, FSK demodulator.
The 555 timer - functional block diagram. The 555 astable multivibrator and monostable multivibrator.

Module 5 (11 hrs)
Instrumentation Amplifier-LM 380 power amplifier-application of LM 380 as audio power amplifier-Intercom using LM 380.
Regulated power supplies - Series op-amp regulator-General purpose IC Voltage regulator 723 –low voltage regulator using 723 – 780X series. Switching regulator-SMPS.

Text Books

1. Ramakant A. Gayakwad, *Op- Amp and Linear I.C.*, PHI
2. Robert F Coughlin, *Operational Amplifiers and Linear Integrated Circuits* , PHI

Reference Books

1. Bali, *Linear Integrated Circuits* (Sigma Series), 1e, Tata McGraw –Hill Education, New Delhi 2008
2. D.Roy Choudhury. *Linear Integrated Circuits*
3. S Salivahanan, *Linear Integrated Circuits*,2e, Tata McGraw –Hill Education New Delhi,2009
4. Botkar KR, *Integrated circuits* -
5. U.A.Bakshi, *Linear Integrated Circuits,* Technical Publishers
6. David L Terrell, *Op-Amps, Design ,Application and Trouble shooting* , Elsevier Publications

EE 010 506: Microprocessors and Applications

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

Objectives

- *To provide in-depth knowledge about 8085 microprocessor architecture, programming and interfacing.*
- *To introduce the 16-bit microprocessor 8086.*

Module 1 (10 hours)
Evolution of Processors – single chip microcomputer – Intel 8085 Microprocessor – signals architecture of 8085 – ALU – register organization – timing and control unit – microprocessor operations – instruction cycle – fetch, decode and execute operation – T-state, machine cycle and instruction cycle – timing diagram of opcode fetch, memory read, I/O read, memory write and I/O write cycles – wait state

Module 2 (13 hours)
Instruction set of 8085: Classification of instructions – different addressing modes – writing assembly language programs – typical examples like 8 bit and 16 bit arithmetic operations, finding the sum of a data array, finding the largest and smallest number in a data array, arranging a data array in ascending and descending order, finding square from look-up table.

Module 3 (11 hours)
Stack and Subroutines: Stack pointer – stack operations – call-return sequence – examples - Counters and time delays
Interrupts of 8085: Software and hardware interrupts- restart instructions – interrupt structure of 8085 – interrupt procedure- vectored and non-vectored interrupts – SIM and RIM instructions

Module 4 (12 hours)
Interfacing: Memory interfacing **-** ROM and RAM – interfacing I/O devices – address space partitioning – memory mapped I/O and I/O mapped I/O schemes – interfacing I/Os using decoders –programmable peripheral devices –8255 block diagram, programming simple input and output ports- DMA controller 8257-– interfacing of 8279 keyboard /display controller- 8275 CRT controller

Module 5 (14 hours)
Intel 8086: Logical Pin diagram –Internal Architecture- pipelining- registers and flags - Operating modes: Minimum mode and Maximum mode.
Physical address generation – memory segmentation –even and odd memory banks.
Addressing modes- instruction set classification – writing simple programs : arithmetic operations.

Text books:

1. Ramesh Gaonkar, *Microprocessor Architecture, Programming and Applications with 8085*, Penram Intl.
2. A.K. Ray and K.M. Burchand , *Advanced Microprocessors and Peripherals* , TMH

Reference books:

1. B.Ram, *Fundamentals of Microprocessors and Microcomputers*, Dhanpat Rai and Sons
2. A.Nagoor Kani , *Microprocessor(8085) and its Applications* , RBA Publications
3. Douglas V. Hall, *Microprocessors and Digital Systems*, McGraw Hill
4. A.P Mathur, *Introduction to Microprocessors*, TMH
5. Douglas V. Hall , *Microprocessors and Interfacing: Programming and Hardware*, TMH
6. **A.** Nagoor Kani , *Microprocessor 8086 Programming and Interfacing*, RBA Publications

EE 010 507: Electrical Machines Lab I

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

Objectives

- *To conduct various tests on DC machines and transformers and to study their performance*

1. Study of 3-point and 4-point starters for D.C machines – mode of connection – Protective arrangements
2. OCC of self and separately excited D.C machines – critical resistances of various speeds. Voltage built-up with a given field circuit resistance. Critical speed for a given field circuit resistance
3. Load test on shunt and compound generator – deduce external, internal and armature reaction characteristics. Find load critical resistance.
4. Characteristics of D.C series machine as motor and generator.
5. Swinburne's and retardation test on D.C machines.
6. Brake test on D.C shunt, compound motors and determination of characteristics.
7. Hopkinson's test on a pair of D.C machines.
8. Separation of losses in a D.C machine.
9. Field's test on D.C machine.
10. Polarity, transformation ratio tests of single phase transformers
11. O.C and S.C tests on single phase transformers – calculation of performance using equivalent circuit – efficiency, regulation at unity, lagging and leading power factors. Verification by direct loading.
12. Sumpner's test on single phase transformers.
13. O.C and S.C tests on three-phase transformers.
14. Scott connection – check for 2 phase – predetermination of primary current for balanced and unbalanced secondary currents – verification by actual loading.
15. Parallel operation and load sharing of two single phase dissimilar transformers.
16. Separation of losses of single phase transformer into hysteresis and eddy current losses.

References

1. Dr. P S Bimbra, *Electrical Machinery*, Khanna Publishers
2. R K Rajput, *A text book of Electrical Machines*, Laxmi publishers

EE 010 508: Integrated Circuits Lab

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

Objectives

- *To expose the students to a variety of practical circuits using various ICs to prove the theories behind them.*

Digital IC

1. Study of TTL gates
2. Characteristics of TTL gates
3. Realisation of sequential circuits –Adder and Subtractor Circuits.
4. Study of SR, JK, D, T and JK Master-Slave Flip Flops
5. Interfacing of seven segment display.
6. Testing of different shift registers.
7. Design and Testing of decoders and encoders.
8. Design and testing of asynchronous counters and modulo N counter.
9. Design and testing of synchronous counters and specified sequence counter.
10. Design and testing of counters using shift registers

Linear IC

11. Design and Testing of Summer, Integrator and Differentiator Circuits.
12. Design and Testing of Inverting and Non-Inverting Amplifiers.
13. Design and testing of astable and mono-stable multi vibrator using IC 741
14. Realisation of ADC and DAC.
15. Design and testing of astable and mono-stable multi vibrator using 555
16. Study of IC Power Amplifier LM 380
17. Study of IC Voltage Regulator 723.
18. PLL as free running oscillator and frequency multiplier.

Optional

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Any experiment relevant to **EE 010 405 and EE 010 505** may be added.

References

1. Digital Principles - Malvino & Leach.
2. Fundamentals of Digital Circuits - A.Anandakumar.
3. Op- Amps and Linear ICs - Ramakant Gayakwad
4. Linear IC - D.Roy Choudhury.