MA 25563: MATHEMATICS-IV

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	1	-	70	30	-	-	100	4	-	4

COURSE OBJECTIVE

To introduce the concepts of complex variable, statistics, stochastic process, Markov chain, reliability and graph theory.

COURSE OUTCOMES

On completion of this course, students are able

- To solve Engineering problems using complex variable techniques and line integrals of a complex valued function.
- To apply the concept of probability to find the physical significance of various distribution phenomena.
- Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability.
- Understand the concepts of reliability and maintainability.
- To apply principals and concepts of graph theory in practical situation.

COURSE CONTENTS

Unit-1 Functions of Complex Variables: Analytic function, Cauchy-Riemann Equations and Harmonic Functions, Conjugate Functions and their Applications, Complex Integrals, Cauchy's Integral Theorem and Integral Formula, Singularities, Poles, Residues, Residue Theorem, Contour Integration for simple cases, Conformal mapping and its Application to two-dimensional problems in electric field.

Unit-2 Statistics: Modern view of Probability theory, Random Variables, Distribution Function and Density Function, Random Variables of Discrete and Continuous type, Functions of two random variables, Bivariate Probability with Conditional and Marginal Probability Distribution.

Unit-3 Stochastic Process and Markov Chain: General Concepts and Definition of Stochastic Processes, Mean, Auto-correlation and Auto-Covariance, Classification of Stochastic Process and Some Problems. Probability Vectors, Stochastic Matrix, Fixed Point of a Matrix, Definition of Markov Chain, Transition Matrix and Graph, Some Theorems and Applications.

Unit-4 Reliability: Basic concepts, Failure law, Bath Tub Curve, Evaluation of Reliability of a Component from Test Data, System Reliability, Components in Series and Parallel, Redundancy, Non-Series Parallel System.

Unit-5 Graph Theory and Combinatorial Optimization: Graphs – Definitions and Basic Properties, Isomorphism, Euler Circuits and Hamiltonian Cycle, Digraphs, Trees- Properties, Spanning Trees, Planer graphs, Shortest Path Problem, Dijkstra Algorithm, Spanning Tree-Kruskal and Prim Algorithm.

Text Books

1. Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
2. Das H. K, Higher Engineering Mathematics, S. Chand New Delhi, 2011.
3. Baisnab A, and Jas M, Elements of Probability and Statistics, Tata McGraw Hill Book Company, New Delhi, 1993.

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Reference books

1. Jain, R.K. and Iyengar S.K, Advanced Engineering Mathematics, Narosa Publishing House, New-Delhi , 2006 .
2. Veerarajan T, Statistics, Probability and Random Process, 2nd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi 2003.
3. Balagurusamy E., Reliability Engineering, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012.
4. Goodaire E.G. and Michael M. Permenter, Discrete Mathematics with Graph Theory.

Assessment

1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%)
2. End semester Theory Exam (70%)

EC25564: ELECTROMAGNETIC WAVES

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

1. Study various laws to develop the Maxwell equations.
2. Characterize Uniform Plane Wave in different mediums.
3. Calculate reflection and transmission of waves at media interface
4. Design and Analyse of Transmission lines to carry out the impedances transformations.
5. Analyse wave propagation on metallic waveguides in modal form

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

UNIT 1: Electromagnetic and Maxwell's Equations:

Basics of vector calculus, Basic Laws of Electrostatics, Gauss's theorem for electrostatics. Equivalence theorem, method of images. Basic laws of magneto statics, Ampere's Law, Duality, Uniqueness and reciprocity theorem. Development of Maxwell's equations.

UNIT 2: Uniform Plane Waves:

Boundary conditions, Wave equation and solution, Wave polarization, Wave propagation in different mediums, Phase and group velocities, Power flow and pointing vector, Surface currents and power loss in a conductor.

UNIT 3: Plane Wave at Media Interface:

Plane waves in arbitrary direction, Reflection and refraction at dielectric interface and total internal reflection, Brewster's angle, Standing waves, Conducting surface, Skin depth.

UNIT 4: Transmission Lines:

Transmission Lines, Equations of voltage and current on Transmission lines, Propagation count and characteristics impedance, Reflection coefficient and VSWR, Impedance transformation on lossless and low loss transmission lines, Power transfer on Transmission lines, Smith chart, admittance Smith chart, Applications of Transmission lines.

UNIT 5: Waveguides:

Wave propagation in parallel plate waveguides, Analysis of wave guides general approach, Rectangular waveguides, TE & TM modes, Surface currents on the waveguide walls, Attenuation in waveguide, Field visualization using simulation software.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT / REFERENCE BOOKS:

1. R.K Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India.
2. 2. Principles of Electromagnetics Matthew N.O Sadiku., 6th edition.
3. 3. David Cheng, Field & wave Electromagnetics.
4. 4. Microwave Engineering, Pozar ,4th edition.

EC 25565: ANALOG CIRCUITS

PREREQUISITE: - Network Theory, Electronic Devices and Engineering mathematics

COURSE OUTCOMES:-

Student should be able to:

1. Analyze and design BJT and FET based amplifier for required frequency specifications.
2. Understand and design power efficient amplifiers.
3. Improve amplifier performance by varying various parameters and design various frequency generators.
4. Design amplifiers for various linear and non linear mathematical operations using linear integrated circuits.
5. Study and design various wave form generators and active filters using linear integrated circuits.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1`	4

THEORY:

Unit 1. Review of BJT & MOSFET biasing, small signal analysis: low frequency model of BJT & MOSFET & its analysis for different configuration, Multistage amplifier.

Unit 2. High frequency analysis: High frequency model of transistor, Frequency response of amplifier, cascading of amplifier & its effect on gain & Bandwidth, Step response of amplifier. Power amplifier, compensation symmetry, configuration, RF circuit, tuned circuit

Unit 3. Feedback Amplifiers : General feedback theory, characteristics of negative feedback amplifiers, Effect of negative feedback on input and output resistance of amplifiers, analysis of feedback amplifiers. Oscillators: Principle of oscillation, calculation of frequency of oscillation & conditions for sustained oscillations, LC Oscillators - Colpitt's, Hartely and Crystal Oscillators, RC Oscillators: Phase shift & Wien bridge oscillators, Frequency stability criteria and controlled oscillators, Voltage.

Unit 4. Operational Amplifiers: Differential amplifier, its modification & transfer characteristics, Internal Architecture of op-amp, offset error in voltages & currents & their temperature drift, Op-amp parameters such as CMRR, slew rate & their measurements, Frequency response of op-amp, study of op-amp ICs like 741, 324, 308 etc. Temperature compensation techniques, current mirror in op-amp. Linear analog systems using op-amp such as - V to I and I to V converters, integrator, differentiator, Two stage and three stage instrumentation amplifiers.

Unit 5. Non-linear Applications and Active Filters using Operational Amplifiers: Non-Linear analog systems: Zero crossing detectors, Square wave & triangular wave generators,

Comparators, Schmitt trigger, Voltage to frequency & frequency to voltage converters, Small signal rectifiers, Sample & hold circuit, Logarithmic amplifier. Active Filters**:** Introduction to active filters: active networks using OP-AMP, approximation to ideal low pass filter, Active filters: LP, HP, BP, BS, & their design guidelines.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

Students will be able to:-

1. Understand single & double stage amplifier, and find its gain and bandwidth.
2. Understand various oscillator circuits and find its frequency of oscillation.
3. Implement various op-amp. based circuits.
4. Implement various active filters.

List of Experiments:

1. To observe the characteristics of single stage R-C coupled amplifier
2. Verify the characteristics double stage R-C coupled amplifier
3. Measurement of input impedance and output impedance of single stage R.C coupled amplifier stage.
4. Study of frequency response of a single stage JFET amplifier
5. Study of double stage R-C coupled amplifier (with feedback).
6. Study of R-C phase shift oscillator
7. Study of Wien bridge oscillator
8. Study of OP-Amp as:
   a) Inverting Amplifier
   b) Non inverting Amplifier.
   c) Summing Amplifier
9. Study of integrator circuit & differentiator circuit using Op Amp
10. Study of class-C amplifier.
11. Study of Active low-pass filter of first order.
12. To study of active high-pass filter

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Sedra & Smith L., Electronics Circuits, 5th ed., 2004, McGraw Hill.
2. Gayakwad R.A., Op AMP & Linear Integrated Circuits. 4th ed., 2007, PHI.
3. Van Valkenburg M.E., Analog Filter Design, 2nd ed., 2001, Holt Rinehart & Winston.

REFERENCE BOOKS RECOMMENDED:-

1. Milliman & Halkias, Integrated Electronics, 2nd ed., 1997, McGraw Hill.
2. Robert Boylsted, Electronic Devices & Circuits, 2nd ed., 2000, PHI.
3. Millman and Grable, Microelectronics, 2nd ed., 1987, TMH**.**

EC 25566: PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand basic concept of probability theory and continuous Random Variable.
2. Investigate descrete random variable and application.
3. Study joint function, moments and distributuion.
4. Make use of theorems related to random signals
5. Develop concepts of Random processes and its application.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

Unit 1: Review of probability theory and Random variable,; Bayes theorem, Continuous Random variable, Gaussian, Rayleigh, Exponential etc their probability density function, probability distribution function and applications.

Unit 2: Discrete random variables , probability mass function, probability distribution function, example random variables and distributions; applications, Probability Generating Function and Moment Generating Function.

Unit 3: Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments with applications; Characteristic functions of a random variable.

Unit 4: Random sequences and modes of convergence; Markov, Chebyshev and Chernoff bounds; Limit theorems; Strong and weak laws of large numbers, central limit theorem.

Unit 5: Random process and its classification, Introduction to Markov model and Hidden Markov model, applications; Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Autocorrelation, Power spectral density.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text/Reference Books:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. Trivedi K.S., *Probability and Statistics with reliability, queuing and Computer Science Applns. II Ed., Wiley*
4. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press

EC 25567: ANALOG AND DIGITAL COMMUNICATION

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

1. Compare different Continuous Wave modulation schemes.
2. Study the behavior of Communication systems in presence of noise.
3. Investigate Pulse modulation schemes and multiplexing schemes.
4. Analyze different digital modulation and demodulation schemes.
5. Evaluate error performance of digital communication systems.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1	4

Unit 1: Amplitude Modulation :- Review of Fourier transform, its properties, Need of modulation, Generation and detection of AM signals, Frequency Division Multiplexing, AM Receivers, Sources of noise, Gaussian and white noise, Quadrature components of noise, Noise in amplitude modulation systems

Unit 2: Angle Modulation: Phase and Frequency modulation, Narrowband FM, Wideband FM, bandwidth of angle modulated signals, Generation and detection of angle modulated signals, Noise in Frequency modulation systems. Threshold effect in angle modulation, Pre-emphasis and Deemphasis filters, Comparison of Analog Modulation systems

Unit 3: Pulse modulation: Sampling process. Sampling of bandpass signals, Quantization, Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation (DPCM). Delta modulation (DM), Adaptive Delta modulation (ADM), Line codes and their PSD, Noise considerations in PCM, Time Division multiplexing.

Unit 4: Baseband Pulse Transmission and Signal space analysis: Inter symbol Interference and Nyquist criterion, Equalization Techniques, Eye patterns, Geometric representation of signals, Optimum detection of signals in noise, Optimum receivers using coherent detection for AWGN channels, Probability of Error.

Unit 5: Pass band Digital Modulation and Trade-offs: Phase Shift Keying (PSK), Frequency Shift Keying (FSK), Quadrature Amplitude Modulation (QAM), Minimum Shift Keying (MSK), their generation, detection, PSD and Probability of Error evaluations. Comparison of Digital Modulation schemes using a single carrier

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.

REFERENCE BOOKS RECOMMENDED:

1. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.
2. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.
3. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

List of Experiments

1. Fourier Synthesis of periodic waveforms.
2. Generation of AM and Double Side band suppressed carrier waveform and multiplexing and demultiplexing FDM signal.
3. Demodulation and detection of AM and DSB-SC using Envelope Detector and Synchronous Detection.
4. Modulation and demodulation of Frequency Modulated waveform,.
5. To generate sampled signal of a band limited sinusoidal signal & its reconstruction, and to observe the two channels Time Division Multiplexing in analog domain & digital domain.
6. Generation & detection of TDM-PCM signal.
7. Analysis of different methods of data transmission to regenerate the data at receiver or repeater.
8. Verification of DM output for various amplitudes and frequencies of input signal and for various clock frequencies.
9. Study of Adaptive Delta Modulation and Demodulation
10. Generation and detection of BPSK and QPSK signal
11. Generation and detection of ASK and FSK signal.
12. Study of QAM modulation and demodulation

ASSESMENT: Viva, Simulation Assignment, Quiz, End semester exam

EC 25568: ELECTRONICS WORKSHOP

Prerequisite: - Engineering physics

Course outcomes:- Student should be able to:

1. Identify various types of electronic components and subsystems and apply them in various Electronic circuits.
2. To understand the working and principle of different types of electronics circuit.
3. Analyze electronics circuits and systems, diagnose faults and their rectification.
4. Design, fabrication and testing of different types of electronics subsystem using analog and digital ICS.
5. Develop skills of writing a structured technical document and its presentation.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
-	-	4	-	-	40	60	100	-	2	2

Practical:

Unit 1. Various types of resistors, capacitors, inductors, their ratings, characteristics & application of single / multistrand wires, coaxial & flat cables, BNC, TNC & N - type connectors, PCB edge connectors, octal & panel connector, relays & band switches, SPST, SPDT, DPDT & push button switches, types of batteries, selections, testing, identification practice for all components, circuit diagrams using components & practicing symbols, cost of various commercially available components.

Unit 2. Thermal resistance, heat sink & its design. Selection of solder, Soldering wire & fluxes, Techniques of soldering, Soldering practice, Soldering defects and their causes.

Unit 3. Design, fabrication & testing of following types of sub systems using discrete components & integrated circuits:

(a) Analog System : series and shunt regulator, multi stage amplifiers, oscillators including VCOs, impedance matching networks, attenuators, popular analog ICs for sub-systems

(b) Digital Circuit: Drivers for increasing fan-out, TTL-CMOS & vice-versa interfacing, applications of 555 IC, counters, 7-segment display, issues involved in product - design, interfacing 7-segment display panels, opto-coupler for isolation etc., popular digital ICs for sub- systems.

Unit 4. Circuit assembly using bread board, Types of PCB & their selection, techniques of making PCB for projects, layout of components, precaution, electrical wiring diagrams, elements of grounding & shielding, PCB layout practice, Mass manufacturing of PCBs, SMD and Through hole components.

Unit 5. Fabrication of small electronic circuit such as power supply, Oscillators etc.
Trouble-shooting: AC & DC Point testing, connection failure, continuity, short circuit and open circuit, component and its pin identification, component failure and its identification, data manual referencing for equivalent component. Technical report writing.

Assessment:- Hardware project, quiz, internal and external viva

Text Books Recommended:-

1. Harper, Handbook of Electronic Components. 2nd edition, 1997
2. Goyal and Khetan, A Monograph of Electronic Design,2nd edition
3. Horowitz and Hill, The Art of Electronics, 3rd edition
4. Mottershed Allen, Electronics devices & circuits,2nd ed., 2006 PHI

HU 22881/24881/25881/27881: VALUES, HUMANITIES AND PROFESSIONAL ETHICS

PRE-REQUISITES: NIL

COURSE OBJECTIVES:-

- **(i)** To make students understand of his/her social responsibility as an engineer.
- **(ii)** To create an awareness on Engineering Ethics, Indian constitution and Human Values
- **(iii)** To make students capable of doing self-exploration and recapitulation
- **(iv)** To make students aware of the global problems

COURSE OUTCOMES: After completion of course, the students will be able to:

CO-1**:** Explain and elaborate the social institutions and Constitution of India through which the society and nation is governed.

CO -2: Describe the kinds of values and ethics and their importance

CO - 3: Contextualize the professional attitude and approaches as per needs of society and values.

CO -4: Explain and illustrate the process of Social, Political and Technological changes in context to global changes

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
-	2	-	-	100	-	-	100	2	-	2

COURSE CONTENT:

1. Role of Humanities in Engineering education, Morals, Values and Ethics,social institutions and association, social stratification in India, social change, Universal and Situational values, coexistence of self and body and their needs and activities.

2. Constitution of India - Preamble, Rights and Duties. Directive Principles, Parliamentary and presidential democracy, The Problem of hierarchy of values and their choice, the views of Mahatma Gandhi on concept Indian nation and democracy.

3. Ethical and decision making capability and its development: Meaning of Ethical dilemma, Concept of personal and group Ethics: Balance between -rights and duties,The Problem of Sustenance of value in the process of Social, Political and Technological changes.

4. Engineering Ethics: engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger variety of moral issued - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy Models of Professional Roles.

5. Global Issues: Multinational corporations - Environmental ethics - computer ethics - weapons development – engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership.

ASSESSMENT:

Only Sessional Work (100 marks) on the basis of internal viva (30) Attendance (20), Quizes/Tests (30) and Presentations (20) will be awarded against the assessment done throughout the session.

Books for references

1. Little, William: An Introduction of Ethics (allied Publisher, Indian Reprint1955)
2. William, K Frankena : Ethics (Prentice Hall of India,1988)
3. Gaur R. R., Sangal R. and Bagaria G. P., Haman Values and Professional Ethics, Excel Books, New Delhi, 2010
4. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
5. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
6. Introduction to the Constitution of India, D.D. Basu

MC

HU 2XXXX/3XXXX: CONSTITUTION OF INDIA

PRE-REQUISITES: NIL
COURSE OBJECTIVES:-

1.To make students understand the importance of Indian constitution.
2. To create an awareness about fundamental rights and fundamental duties.
3. To make students aware of the working of the union government.
4. To make students comprehend the importance of judicial powers and emergency provisions in India.

COURSE OUTCOMES: After completion of course, the students will be able to:
1.Explain and elaborate the Indian Constitution through which the society and nation is governed.
2. Describe the list of fundamental rights and fundamental duties.
3. Elucidate the types of emergencies in Indian constitution.
4. Explain and illustrate the procedure of amendments in Indian constitution.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
2	-	-	-	50	-	-	50	-	-	-

Course Contents

UNIT 1. Meaning and significance of Constitution, Making of Indian Constitution – Sources, Salient features of Indian Constitution and Preamble.

UNIT 2. Scheme of the Fundamental Rights and Duties : right to Equality-article 19- article 21, legal status of duties, Directive Principles of states policy- its importance and implementation.

UNIT 3. Federal structure, legislative and financial powers (union and states), Three lists (union, state and concurrent), parliamentary form of government in India- The constitution powers and status of the President of India.

UNIT 4. Judicial system and local governance in India: Its constitutional powers, Historical perspectives of the constitutional amendments in India, Amendment of the constitutional powers procedure, Local self government - 73rd and 74th Amendment.

UNIT 5. Emergency provisions: President rule, National Emergency, Financial Emergency, Election commission and its constitutional powers and procedures.

ASSESSMENT:
Only Sessional Work (100 marks) on the basis of viva (30) Attendance (20), Quizes/Tests/Activities (30) and Presentations (20) will be awarded against the assessment done throughout the session.

Books Recommended:

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti