UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Course Description

Title of Course: Values & Ethics in Profession
Course Code: HU301
L-T Scheme: 3L+1T **Course Credits: 3**

Introduction:

This course teaches students the basic principles of Values and Ethics within profession. These deals mainly with

- Values in professional life
- Ethics in professional life
- Resources depletion
- Conservation of resources for future generations
- Technology transfer
- Eco friendly Technology
- Value crisis in society
- Present society without values and Ethics.

Objectives:

This course relates to the present world and teaches students the need and importance of values and the problems faced by the present society in terms of depletion of natural resources and how to control the same for the sake of future generations.

Learning Outcomes:

Knowledge:

1. Understand the present scenario of degradation of values and Ethics system
2. Depletion of resources and how to conserve them.
3. Club Of Rome and what all stalwarts have thought to improve the situation
4. Sustainable Development.
5. Value spectrum of a good life
6. Present societal changes in terms of values and ethics
7. What steps to be taken to improve value system?
8. How to avoid conflicts to have a peaceful job life.

Course Contents:

Unit 1: Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: Sustainable development Energy Crisis: Renewable Energy Resources Environmental degradation and pollution. co-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology Movement of Schumacher; later developments Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Unit 2: Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond.

Unit 3: Values Crisis in contemporary society Nature of values: Value Spectrum Of good life Psychological values: Integrated personality; mental health Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity Moral and ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

AN Tripathi, Human values in the Engineering Profession, Monograph published byIIM,Calcutta1996

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Course Description

Title of Course: Mathematics-III
Course Code: M301
L-T Scheme: 3-1 **Course Credits: 4**

Introduction:
The goal of this mathematics course is to provide high school students and college freshmen an introduction to basic mathematics and especially show how mathematics is applied to solve fundamental engineering problems. The Topics to be covered (tentatively) include:

Fourier Series & Fourier Transform.

Introduction to Functions of a Complex Variable & Conformal Mapping.

Basic Probability Theory.

Partial Differential Equation (PDE) and Series solution of Ordinary Differential Equation (ODE).

Course Objectives:
In this course, the students will learn differentiation and integration of Complex functions and mappings in the complex plane. They are introduced to Fourier Transforms to stimulate interest in communications, control and signal processing to prepare them for follow up courses in these areas. They also learn to extend and formalize knowledge of the theory of probability and random variables and get motivated to use of statistical inference in practical data analysis. They are also introduced to Partial Differential Equations, their types and solutions.

Learning Outcomes:
Knowledge:
At the end of this course, students will be able to
1. Understand and analyze analytic functions, evaluate line integrals of complex functions.
2. Apply fundamental mathematical properties of the Fourier transform including linearity, shift, symmetry, scaling, modulation and convolution and calculate the Fourier transform or inverse transform of periodic functions.
3. Construct probability distributions of a random variable based on real world situation and use it to compute the mean and variance; approximate a given data to fit a curve and analyze and interpret the correlation between two sets of data.
4. Form PDE by eliminating arbitrary constants / functions and solve linear PDEs by direct method and separation of variables.

Application:
1. Fourier transforms (FT) take a signal and express it in terms of the frequencies of the waves that make up that signal.
2. Probability is used in Weather forecasting, calculating and in many more engineering applications.
3. At the end of this course the student should be able to apply the above mentioned concepts to engineering problems.

Course Contents:

Unit 1: **Fourier Series & Fourier Transform:** Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period 2l, Dirichlet's conditions, Sum of Fourier series. Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier series: Construction of Half Range Sine Series, Construction of Half Range Cosine

Series. Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Fourier Transform of Derivatives. Convolution Theorem (statement only), Inverse of Fourier Transform.

Unit 2: **Introduction to Functions of a Complex Variable & Conformal Mapping:** Complex functions, Concept of Limit, Continuity and Differentiability. Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. Construction of Analytic functions: Milne Thomson method, related problems.

Unit 3: Basic Probability Theory: Classical definition and its limitations. Axiomatic definition. Some elementary deduction: i) $P(O)=0$, ii) $0 \le P(A) \le 1$, iii) $P(A')=1-P(A)$ etc. where the symbols have their usual meanings. Frequency interpretation of probability. Addition rule for 2 events (proof) & its extension to more than 2 events (statement only). Related problems. Conditional probability & Independent events. Extension to more than 2 events (pairwise & mutual independence). Multiplication Rule. Examples. Baye's theorem (statement only) and related problems.

Definition of random variable. Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof). Definitions of Expectation & Variance, properties & examples. Some important discrete distributions: Bernoulli, Binomial & Poisson distributions and related problems. Some important continuous distributions: Normal distributions and related problems.

Unit 4Partial Differential Equation (PDE) and Series solution of Ordinary Differential Equation (ODE): Basic concepts of PDE. Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transforms methods.

Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace &Fourier transform methods.

PDE I: One dimensional Wave equation.
PDE II: One dimensional Heat equation.
PDE III: Two dimensional Laplace equation.

Text Books

1. Engineering Mathematics-III(B.K Pal and K.Das) [All course]

Reference Books:

1. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
2. Das N.G.: Statistical Methods, TMH.
3. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Numerical Methods
Course Code: M(CS)301
L-T Scheme: 2-1 **Course Credits: 3**

Introduction:

This course offers an advanced introduction to numerical linear algebra. Topics include direct and iterative methods for linear systems, eigenvalue decompositions and QR/SVD factorizations, stability and accuracy of numerical algorithms, the IEEE floating point standard, sparse and structured matrices, preconditioning and linear algebra software. Problem sets require some knowledge of MATLAB

Objectives:
The primary goal is to provide engineering majors with a basic knowledge of numerical methods including: root finding, elementary numerical linear algebra, integration, interpolation, solving systems of linear equations, curve fitting, and numerical solution to ordinary differential equations'' language and SCILAB is the software environment used for implementation and application of these numerical methods. The numerical techniques learned in this course enable students to work with mathematical models of technology and systems.

Learning Outcomes:
Knowledge:

1. Students would be able to assess the approximation techniques to formulate and apply appropriate strategy to solve real world problems.
2. Be aware of the use of numerical methods in modern scientific computing.
3. Be familiar with finite precision computation.
4. Be familiar with numerical solution of integration, linear equations, ordinary differential equations, interpolations.

Application:

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints
4. such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
5. An ability to function on multidisciplinary teams

Course Contents:
Unit 1: Approximation in numerical computation: Approximation of numbers, Types of errors, Calculation of errors.

Unit 2: Interpolation: Finite Differences and Divided differences, Newton forward/backward Interpolation, Lagrange's method and Newton's divided difference method.

Unit 3: Numerical integration: Trapezoidal rule and Simpson's 1/3 rule.

Unit 4: Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.

Unit 5: Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method and order of convergence.

Unit 6: Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.

Text Books

1. Dutta& Jana: Introductory Numerical Analysis(All course).
2. Dr.B.S.Grewal:Numerical Methods in Engineering &science(All Course).
3. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).

References

1. Baburam: Numerical Methods, Pearson Education.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Circuit Theory & Networks
Course Code: EC301
L-T Scheme: 3-1 **Course Credits: 4**

Introduction:

This course explores the different types of network and circuits. It also helps in analysis signals and systems alongside the knowledge of switching and the corresponding response in a network. The Topics to be covered (tentatively) include:

- Electrical systems
- Different network theorems
- Analysis of signals
- Analysis of transient behavior in electrical systems
- Two port network
- Network topology
- Filters

Objectives:
To develop the fundamental tools of linear circuit analysis which will be useful to all engineers. To learn the details of circuits analysis including the network elements, sources and operational amplifiers. To prepare students for more advanced courses in circuit analysis.

Learning Outcomes:

Knowledge:

1. Identify linear systems and represent those systems in schematic form
2. Apply Kirchhoff's current and voltage laws and Ohm's law to circuit problems
3. Simplify circuits using series and parallel equivalents and using Thevenin and Norton equivalents
4. Simplify and analyze the magnetically coupled circuits.
5. Identify and model first and second order electric systems involving capacitors and inductors
6. Predict the transient behavior of first and second order circuits

Application:

1. The application of this course is immense and vivid, anything that is electrically operated can be analyzed and understood with the help of the understanding this subject.

Course Contents:

Unit 1: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.

Unit 2: Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, modeling of coupled circuits, Solution of problems.

Unit 3: Impulse, Step & Sinusoidal response of RL, RC and RL Circuits. Transient analysis of different electrical circuits with and without initial conditions, Concept of Convolution theorem and its application. Solution of Problems with DC & AC sources.

Unit 4: Fourier series and Fourier Transform (in Continuous domain only).Application in circuit analysis.

Unit 5: Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's &Maximum power transfer theorem.

Millman's theorem and its application in three phase unbalanced circuit analysis. Solution of Problems with DC & AC sources.

Unit 6: Concept of Tree, Branch, Tree link, Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials Duality.

Unit 7: Open circuit Impedance & Short circuit Admittance parameter, Transmission parameters, Hybrid parameters and their inter relations. Driving point impedance & Admittance.

Unit 8: Analysis and synthesis of Low pass, Highpass, Bandpass, Bandreject, All pass filters (first and second order only) using operational amplifier.

Text Books

1. S P Ghosh, A K Chakraborty, Network Analysis and Synthesis- McGraw Hill.

References

1. C. K. Alexander, M. N. O. Sadiku, *Fundamentals of Electric Circuits (Fifth Edition),* McGraw Hill, 2013.
2. Introduction to Electric Circuits, R. C. Dorf, Wiley 1993 (second edition)
3.D. E. Johnson, J. R. Johnson, J. L. Hilburn, and P. D. Scott, *Electric Circuit Analysis*, Third Edition, Prentice-Hall 1997.
4.Electric Circuit, M. Nahvi& J. Edminister, Schaum's outline series, The Mc Graw HillCompany.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Course Description

Title of Course: Solid State Devices
Course Code: EC302
L-T Scheme: 3 **Course Credits: 3**

Introduction:
The branch of physics that deals with the study of rigid solid matter is called Solid state physics. It is done through a variety of methods including quantum mechanics, electromagnetism, metallurgy and crystallography and forms the theoretical foundation of materials science as a whole. The basic function of solid state physics is to study how the atomic properties of a solid material affects its overall properties. Solid-state electronics are those circuits or devices built entirely from solid materials and in which the electrons, or other charge carriers, are confined entirely within the solid material. The term is often used to contrast with the earlier technologies of vacuum and gas-discharge tube devices, and it is also conventional to exclude electro-mechanical devices (relays, switches, hard drives and other devices with moving parts) from the term solid state. Common solid-state devices include transistors, microprocessor chips, and RAM. More recently, the integrated circuit (IC), the light-emitting diode (LED), and the liquid-crystal display (LCD) have evolved as further examples of solid-state devices.

Objectives:

1. Describe crystal properties and growth of semiconductors.
2. Apply basic quantum mechanics to atomic and semiconductor models.
3. Derive equations of charge transport in semiconductors under normal operating conditions.
4. Determine charge, electric field, potential distributions, and energy band diagrams in pn-junction diodes under normal operating conditions.
5. Apply the charge diffusion equation to pn-junction diodes and bipolar junction transistors, and derive I-V characteristics for diodes and transistors, and small-signal admittance and transient response for diodes.
6. Derive I-V characteristics of field-effect-transistors.
7. Discuss the fundamental applications of photodiodes, solar cells, and light-emitting diodes.
8. List fabrication steps used in production of pn-junction diodes and various types of transistors.
9. Describe the impact of electronics on the technology and contemporary issues in solid-state electronics.

Learning Outcomes:
Knowledge:

1. To acquire knowledge about semiconductor physics for intrinsic and extrinsic materials.
2. To learn the basics of semiconductor diodes, BJTs and their small signal and high frequency analysis.
3. To study and analyze the performance of FETs on the basis of their operation and working.
4. To study and analyze the rectifier and regulated circuits.

Application:

1. Electronic devices such as mobiles and computers
2. Optical devices such as lasers and fiber optics
3. Magnet based devices such as Magnetic Resonance Imaging (MRI) and vibrating devices
4. Silicon based logic and memory bits

Course Contents:

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Unit 1: Energy Bands and Charge Carriers in Semiconductors-Energy-band (E-k)diagram ,effective mass, wave vector, Debye length, Direct & indirect band-gap semiconductors; Carrier distribution, Fermi-level, Intrinsic& Extrinsic semi conductors, Non-equilibrium in carrier distribution; drift, diffusion, scattering; Piezo & Hall effects. Details: [Recapitulation of Conductor, Insulator & Semiconductor with special emphasis on the concept of energy bands and band-gaps, E-k diagrams for direct and indirect band-gap semiconductors; Concept of the effective mass & crystal momentum, concept of wave-vector 'k'; Intrinsic & extrinsic semiconductors, idea about degeneracy and non- degeneracy. Carrier concentration in terms of bulk Density of states and Fermi-Dirac distribution (no derivation, expression and significance only); Concept of Fermi level, F.L. shift with doping & temperature; Non-equilibrium condition: Drift & diffusion of carriers with simple expressions; Hall effect & Piezo-electric effect, Carrier scattering (basic idea only).Generation and re-combination, quasi-Fermi energy level (concept only)

Unit 2: Rectifier and detector diodes: P-N junction & Schottky junction physics, I-V relation, Junction capacitances, Diode switching, Optical devices & Solar cells, Tunnel diode. Details: Homo-and Hetero -junctions–examples of semiconductor-semiconductor junction (Homo) & Metal-metal, Metal-S.C. junctions (Hetero-) [Recapitulation of the rectifying properties of these two types of junctions;] Homo-junction –Semiconductor-semiconductor p-n junction & rectification(recapitulation) ; Plot of junction voltage, field and depletion charge with distance by solving simple1D Poisson's Equation(Gradual Channel & Depletion Approximations); Schottky contact& Schottky diode; Junction capacitances in p-n diodes (recapitulation)and their expressions; Application of Diode capacitance in Varactor Diodes; Derivation for Forward and Reverse current, piece-wise linear diode- characteristics, concept of Diode resistance & Differential diode resistance; Diode switching & diode switch, properties of rectifier and switch in diodes; Importance of reverse current in optical detectors, photo-diodes, solar cells; Spontaneouse mission & Stimulated emission- optical devices (basic idea only).],Tunnel diode -(basic principle only- importance of negative resistance).

Unit 3: Bipolar Junction Transistors: Physical mechanism, current gain, minority current distribution; Punch-through and avalanche effect; High voltage and high power transistors; Frequency limitations, high frequency transistors, Power transistors. Details: [Emphasis on BJT as a current controlled device, amplification property of BJT; I-V characteristics (input & output) with derivation, input & output characteristics for CB. CE & CC mode, current amplification factors α for CB mode and β for CE mode; Eber's Moll model for Static behavior & Charge controlled model (without derivation) for dynamic behavior, equivalent circuits.; Basic idea about Photo-transistors& Power transistors (only their features Vis-à-vis the ordinary transistors); PNPN transistors-simple working Principle, I-Vcharacteristics, triggering, mention of Triacs, Diacs & Thyristors.]

Unit 4: Field Effect Transistors: JFETS, IJFETS and MOSFETs; MOS-capacitors, flat band and threshold voltages; P and N-channel MOSFETS, CMOS and VLSI MOSFETS, Semiconductor sensors and detectors. Details: [Concept of Field effect device (recapitulation), channel modulation & channel isolation;] JFET -behavior, characteristics; MOSFET-channel inversion, Ideal Threshold voltage, MOS capacitances, depletion width, surface field and potential (by solving Poisson's equation with gradual channel & depletion approximations); Real MOSFET & Threshold voltage for real MOSFET,I-V characteristics with expressions for saturation and non-saturation regions (concepts but no detail derivations, empirical relations to be used for solving problems); Equivalent circuit for MOSFET; MOSFET for VLSI- scaling issues (basic concept of Short Channel Effects only);]

Text Books

1. Neamen- Semiconductor Physicsand Devices, TMH
2. Bhattacharya&Sharma-SolidStateElectronicDevices- Oxford

References

1. Singh &Singh- Electronics Devices and Integrated Circuits–PHI
2. Bogart,Bisley&Rice- ElectronicsDevices and Circuits- Pearson
3. Kasap-Principlesof ElectronicMaterials andDevices- TMH
4. Boylestad&Nashelsky- ElectronicsDevices and CircuitTheory- Pearson
5. Salivahanan,Kumar &Vallavaraj- ElectronicsDevices and Circuits- TMH
6. Maini&Agrawal- ElectronicsDevices and Circuits- Wiley

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Analog Electronic Circuits
Course Code: EC303
L-T Scheme: 3-1 **Course Credits: 4**

Introduction:

This course examines bipolar junction transistor biasing concept, operational amplifier and different types of filters and tuned amplifiers circuit and their application. The Topics to be covered (tentatively) include:

- Graduate will be able to understand the basic properties of electronic system
- Graduate will be able to understand different type of diode and their applications
- Graduate will acquire knowledge on bipolar junction transistor and applications
- Graduate will acquire knowledge of mosfet and circuits
- Graduate will acquire knowledge of voltage and power
- Graduate will get knowledge on feedback in amplifiers and oscillator
- Graduates will be able to understand and apply knowledge differential amplifier
- Graduates will be able to understand on operational amplifier and its applications
- Graduates will be able to understand and apply knowledge filters and tuned amplifiers
- Graduate will acquire knowledge of waveform generation and shaping circuit

Objectives:

The Course Educational Objectives are:

- An understanding of basic EE abstractions on which analysis and design of electrical and electronic circuits and systems are based, including lumped circuit, digital and operational amplifier abstractions.
- The capability to use abstractions to analyze and design simple electronic circuits.
- The ability to formulate and solve the differential equations describing time behavior of circuits containing energy storage elements.
- An understanding of how complex devices such as semiconductor diodes and field-effect transistors are modeled and how the models are used in the design and analysis of useful circuits. The capability to design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.

Learning Outcomes:

Knowledge:

Once the student has successfully completed this course, he/she will be able to answer the following questions or perform following activities:

1. Learn how to develop and employ circuit models for elementary electronic components, e.g., resistors, sources, inductors, capacitors, diodes and transistors.

2. Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and the node method.
3. Appreciate the consequences of linearity, in particular the principle of superposition and Thevenin-Norton equivalent circuits.
4. Gain an intuitive understanding of the role of power flow and energy storage in electronic circuits.
5. Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.
6. Learn how the primitives of Boolean algebra are used to describe the processing of binary signals and to use electronic components such as MOSFET's as building blocks in electronically implementing binary functions
7. Learn how the concept of noise margin is used to provide noise immunity in digital circuits. Be introduced to the concept of state in a dynamical physical system and learn how to analyze simple first and second order linear circuits containing memory elements.
8. Be introduced to the concept of singularity functions and learn how to analyze simple circuits containing step and impulse sources Be introduced to the concept of sinusoidal-steady-state (SSS) and to use impedance methods to analyze the SSS response of first and second-order systems
9. Gain insight into the behavior of a physical system driven near resonance, in particular the relationship to the transient response and the significance of the quality factor Q. Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation and filtering on electronic signals

Application:
1. To understand the principles of gain and loss and the function of amplifiers using analog circuits element.
2. Use of simulation program with integrated circuit emphasis (SPICE)/electronic computer aided design (ECAD) techniques to analyze and develop circuits.
3. Use of prototyping methods eg breadboard, strip board, printed circuit board (PCB); typical circuits eg filter, amplifier, oscillator, transmitter/receiver, power control, circuits/systems with telecommunication applications

Course Contents:
Unit 1: Active & Passive Devices, overview of analog circuits, application of analog circuits-implementation etc.-[Linear integrated circuits-D. Roy Choudhury, ShailB. Jain (Chapter 6&7) Electronic Devices and Circuit Theory- Boylested (Chapter-1&2)]

Unit 2: Characteristics of ideal & real diodes, diode circuits rectifiers, clipping, clamping, special types of diodes & their applications schottky, varactor, photodiodes, LEDs,-[Linear integrated circuits-D. Roy Choudhury, ShailB. Jain (Chapter 6&7) Electronic Devices and Circuit Theory- Boylested (Chapter-1&2)]

Unit 3: Characteristics of BJT; Ebers-Moll equations and large signal models; inverse mode of operation, early effect; BJT as an amplifier and as a switch; DC biasing of BJT amplifier circuits; small signal operations and models; Single state BJT amplifiers – CE, CB and CC amplifiers; high frequency models and frequency response of BJT amplifiers; Basic design in discrete BJT amplifiers; complete design examples; Basic BJT digital logic inverter; SPICE modeling of BJT and amplifier circuits.- [Electronic Devices and Circuit theory – Boylestead and Nashesky – PHI/Pearson Education(Chapter-3,4) Electronics–fundamental— D Chattopadhaya & P. C. Rakhit (Chapter---8) Microelectronic circuits---Sedra &Smith (Chapter---3)]

Unit 4: MOSFET -operational Characteristics; PMOS, NMOS and CMOS current voltage characteristics; SPICE model of MOSFET; DC analysis; Constant Current Sources and Sinks, MOSFET as an Amplifier and as a Switch; Biasing on MOS Amplifiers; Small Signal Operation of MOS amplifiers, Common-source, common gate and source Follower Amplifiers; CMOS amplifiers; MOSFET Digital logic inverters, voltage transfer characteristics, SPICE modeling of MOSFET circuits.
[Electronic Devices and Circuit theory – Boylestead and Nashesky – PHI/Pearson Education(Chapter-5)]

Unit 5: Classification amplifiers; Class A, Class B, Class AB Class C – Circuit operation, transfer characteristics, power dissipation, efficiency. Practical BJT and MOS power transistors, thermal resistance, heat sink design; IC power amplifiers.-[Electronic Devices and Circuit theory – Boylestead and Nashesky – PHI/Pearson Education(Chapter-15)]

Unit 6: Feedback concept and definition; Four basic feedback topologies; Analysis of Series-shunt, series-series, shunt-shunt and shunt-series feedback amplifiers, stability in feedback amplifiers, frequency compensation; principle of sinusoidal oscillators and barkhausen criterion, Active-RC and Active-LC sinusoidal oscillators; Wien Bridge; Phase-Shift, Quadrature Oscillators, Crystal Oscillators, application in voltage regulation-[Electronics devices and circuits (Chapter 14&15) S Salivahanan N.Sureshkumar A.Vallavaraj Electronics-Fundamentals and Applications----- D Chattopadhayay, P.C.Rakhit (Chapter—10)]

Unit 7: Concept of operational amplifiers; Ideal operational amplifier parameters; Inverting and non-inverting configurations; Common OPAMP IC: Gain-frequency and Slew rate, SPICE modeling and simulation examples; Instrumentation amplifiers, Integrators, Differentiators, Logarithmic Amp; Multipliers; Comparators; Schmitt triggers.-[Op amps and linear Integrated Circuits - R.A. Gayakwad(chapter-3 & 4) Linear integrated circuits-D. Roy Choudhury, shail B. Jain(Chapter-4)]

Unit 8: Filter characteristics and specifications; First and Second Order Filter functions, First-order and second order filter network using OPAMPS; Tuned Amplifiers, Basic principle, amplifiers with multiple tuned circuits, Synchronous and Stagger tuning, RF amplifiers considerations-[Electronics Devices and Circuits----S Salivahanan N.Sureshkumar A.Vallavaraj(Chapter-8)]

Unit 9: Multivibrators – Astable, monostable and bistable circuits, bistable circuit as memory element comparator generation of square, triangular waveforms and standardized pulse using AMV and MMV, Application of 555 timer-[Linear Integrated Circuit:---------D. Roy Choudhary S.B.Jain(Chapter-9)]

Text Books

1. Microelectronic Circuits – Sedra and Smith(Fifth Edition) (Oxford)
2. Electronic Devices and Circuit theory – Boylestead and Nashesky – PHI/Pearson Education
3. Millman and Halkias – Integrated Electronics – TMH Op Amp and Linear Ics.
4. Electronics–fundamental— D Chattopadhaya & P. C. Rakhit
5. Linear integrated circuits-D. Roy Choudhury, ShailB. Jain

References

1. R. A. Gackward – PHI/Pearson Education
2. Sergio Franco – Operational Amplifier (JMH)
3. Electronics Devices and Circuits----S Salivahanan N.Sureshkumar A.Vallavaraj

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Course Description

Title of Course: Circuit Theory & Network Lab
Course Code: EC391
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:
1. To learn and understand to design electrical circuit practically or through any simulation software.
2. To provide an understanding of the circuit designing aspects in bread board.
3. To provide a window to investigate and verify various laws, theories, and concepts regarding electrical circuits practically or virtually by simulation software.

Learning Outcomes: The students will have a detailed knowledge of electrical circuit design using different electrical elements and sources through bread board or by any simulation software. The students will also get the opportunity& better understanding of various concepts, laws, & theories applicable in any electrical circuit by investigating and varying them in the practically designed circuit.Upon the completion of Operating Systems practical course, the student will be able to:

- **Understand** and implement electrical circuit design knowledge to realize any electrical circuit practically
- **Use** modern simulation software to recreate any practical circuit virtually**.**
- **Understand** the benefits of circuit design in bread board.
- **Analyze** designed circuit to see weather various laws, theories, and concepts regarding electrical circuits holds or not..
- **Simulate**electrical circuitsthrough any simulation software to check weather various laws, theories, and concepts regarding electrical circuits they studied holds or not .\

Course Contents:
Exercises that must be done in this course are listed below:
Exercise No.1: Verification of Thevenin's Theorem: Hardware/Simulation
Exercise No. 2: Verification of Norton's Theorem: Hardware/Simulation
Exercise No. 3: Verification of Maximum Power Transfer Theorem: Hardware/Simulation
Exercise No. 4: Verification of Superposition Theorem: Hardware/Simulation
Exercise No. 5: Study of Z-parameters of any practical circuit treated as Two-port network: Hardware/Simulation
Exercise No. 6: Study of Y-parameters of any practical circuit treated as Two-port network: Hardware/Simulation
Exercise No. 7: Study Resonance of a series RLC circuit: Hardware

Text Book:

1. S.P.Ghosh & A.Chakraborty , "Circuit Theory & Networks", TMH
2. Muhammad H. Rashid, "Introduction to PSpice Using Orcad for circuits and Electronics", Pearson Education.

Recommended Systems/Software Requirements:
1. MATLAB
2. SPICE.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Solid State Devices Lab
Course Code: EC392
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:

1. To provide the students with a hands-on experience on the theoretical concepts through simple experiments.
2. To develop the ability to design and validate their knowledge through open ended experiments.

Learning Outcomes:
On successful completion of this lab course, the students would be able to

1. Demonstrate and analyze Fermi Energy level at different temperature.
2. Analyze effect of built in potential with respect to doping.
3. Demonstrate Energy band diagram of PN junction of diode.
4. Demonstrate various characteristic of BJT and Amplifier.
5. Conduct an open ended experiment in a group of 2 to 3.

Course Contents:
List of Experiments:

1. Program to compute Number of atoms/cm3 in cubic crystals of silicon atom
2. Program to plot f(E) versus Energy for different temperatures
3. Compute & plot Vbi as a function of doping (NA or ND)
4. Program to generate an energy band diagram of a PN junction
5. Program to construct a plot of a square law relationship (IDsat/IDO versus VG/VP) of FET
6. Program to construct a plot of the depletion width versus the impurity concentration
7. Solution of difference equations to find the zero input and the zero state responses.
8. Study input characteristics of BJT in common-emitter configuration.
9. Study output characteristics of BJT in common-emitter configuration for different base currents and hence determine hybrid parameter.
10. Study the variation of small-signal voltage gain with frequency of a common-emitter RC coupled amplifier.

Text Book:

1) Kannan Kano(1997), Semiconductor Devices, 1st Edition, Pearson Education.
2) Jacob Millman, Christos C. Halkias (2009), Integrated Eletronics, TMH publications.

Recommended Systems/Software Requirements:

SCILAB, PSIM

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Course Description

Title of Course: Analog Electronic Circuits Lab
Course Code: EC393
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:
1. Impart understanding of working principles and applications ofsemiconductor devices in the design of electronic circuits.
2. Introduce basic applications like rectifiers, amplifiers and other signal conditioning circuits with emphasis on practical designconsiderations.
3. To enhance the understanding of the topics in the curriculum, specific activities have been designed as conceptual and handsonaid.

Learning Outcomes: The students will have a detailed knowledge of the concepts of process and Onsuccessful completion of this course, the students will be able to:
1. Analyze and appreciate the working of electronic circuitsinvolving applications of diodes and transistors.
2. Comprehend working of amplifiers.
3. Design simple analog circuits using general purpose op-amp IC741.
5. Develop simple projects based on the different devices studiedin this course.

Course Contents:
Exercises that must be done in this course are listed below:
1. Study of Diode as clipper & clamper
2. Study of Zener diode as a voltage regulator
3. Study of ripple and regulation characteristics of full wave rectifier without and with capacitor filter
4. Study of characteristics curves of B.J.T
5.Study of characteristics curves of FET.
6. Design a two-stage R-C coupled amplifier & study of it's gain & Bandwidth.
7. Study of class A power amplifiers.
8. To construct a Class B complementary symmetry power amplifier and observe the waveforms with cross-over distortion and to compute maximum output power and efficiency
9. Design of a Schmitt Trigger using 555 timer.
10. Study Inverting and Non –inverting Amplifier

Text Book:
1 Kannan Kano(1997), Semiconductor Devices, 1st Edition, PearsonEducation.
2 JacobMillman, Christos C. Halkias (2009), Integrated Eletronics,TMH publications.
3Boylestad, Louis Nashalsky(2007), Electronic Devices and CircuitTheory, 9th Edition, PHI Publication.

Recommended basic lose component Requirements:
1. Resisters , Capacitors ,Transistors ,Inductors ,Bread board and jumper wires
2. Input Output Device Function Generator CRO Probes.
3. Power Supply Proper Requirement.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Course Description

Title of Course: Numerical Methods Lab
Course Code: M(CS)391
L-T–P Scheme: 0-0-3Course Credits: 2

Introduction:

This course offers an advanced introduction to numerical linear algebra. Topics include direct and iterative methods for linear systems, eigenvalue decompositions and QR/SVD factorizations, stability and accuracy of numerical algorithms, the IEEE floating point standard, sparse and structured matrices, preconditioning and linear algebra software. Problem sets require some knowledge of MATLAB

Objectives:

1. To give an overview of what can be done.
2. To give insight into how it can be done.
3. To give the confidence to tackle numerical solutions.
4. An understanding of how a method works aids in choosing a method. It can also provide an indication of what can and will go wrong, and of the accuracy which may be obtained.
5. To gain insight into the underlying physics.
6. The aim of this course is to introduce numerical techniques that can be used on computers, rather than to provide a detailed treatment of accuracy or stability.

Learning Outcomes:

Knowledge:

On completion of this course, the student will be able to:

1. Demonstrate skills in using computer programming tools for engineering calculations.
2. Demonstrate ability to construct simple computer algorithms using a programming tool.
3. Apply simple numerical methods to solve mathematical problems with relevance to civil engineering.
4. Appreciate the limitations and the applicability of the numerical methods.
5. Apply computer-based numerical methods for the solution of engineering problems.

Course Contents:

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

Text Books:

1. Introductory method of numerical analysis, Sastry S.S
2. Computer Programming in fortran 77, Rajaraman V
3. Numerical methods: for scientific and engineering computation,Mahinder Kumar Jain