SANJAY GANDHI INSTITUTE OF ENGINEERING & TECHNOLOGY

Syllabus & Evaluation Scheme

(Effective from Session 2017-2018)

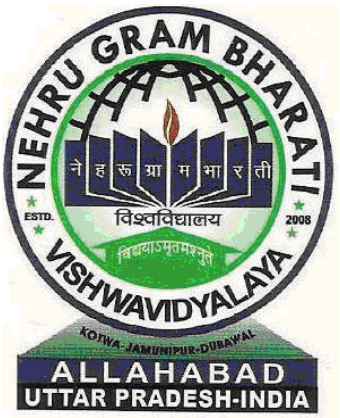
On

Choice Based Credit System (CBCS)

Electronics and Communication Engineering

Bachelor of Technology (B.Tech.)

2nd Year (III & IV Semester)



NEHRU GRAM BHARATI VISHWAVIDYALAYA

KOTAWA-JAMUNIPUR-DUBAWAL

ALLAHABAD

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REVISED SYLLABUS & EVALUATION SCHEME

B.Tech. (Electronics and Communication Engineering)

[Effective from the session 2017-18]

Year-2nd, Semester-III

S. No.	Subject Code	Subject	Periods			Evaluation Scheme				Subject Total	Credits
						Sessional Exam.			ESE		
			L	T	P	CT	Assig/ Att.	Total			
THEORY											
1.	EAS-301/ EOE-030 to 039	Engg. Mathematics-III/ Science Based Open Elective	3	1	0	20	10	30	70	100	4
2.	EVE-301/ EAS-302	Human Values & Professional Ethics/ Environment & Ecology	3	0	0	20	10	30	70	100	3
3.	EEE-305	Network Analysis & Synthesis	3	0	0	20	10	30	70	100	3
4.	EEC-301	Digital Logic Design	3	0	0	20	10	30	70	100	3
5.	EEC-302	Electronic Devices and Circuits	3	1	0	20	10	30	70	100	4
6.	EEC-303	Signal & Systems	3	0	0	20	10	30	70	100	3
PRACTICAL / TRAINING / PROJECT											
7.	EEC-351	Digital Logic Design Lab	0	0	2	30	20	50	50	100	1
8.	EEC-352	Electronics Devices and Circuits Lab	0	0	2	30	20	50	50	100	1
9.	EEC-353	Signals & Systems Lab	0	0	2	30	20	50	50	100	1
10.	EEC-354	Electronics Workshop & PCB (Printed Circuit Board) Design Lab	0	0	2	30	20	50	50	100	1
First Year Engineering Programme for B.Tech. 2nd Year lateral entry students belonging to B.Sc. Stream											
11.	EME-101	Elements of Mechanical Engineering*	3	1	0	20	10	30	70	100*	-
12.	ECE-151	Computer Aided Engineering Graphics*	0	0	3	30	20	50	50	100*	-
		Total	**18**	**2**	**8**	**240**	**140**	**380**	**620**	**1000**	**24**

L - *Lecture*
T - *Tutorial*
P - *Practical*
CT - *Cumulative Test*
Assig/Att. - *Assessment/Assignment/Attendance*
ESE - *End Semester Exam.*

***B.Tech. 2nd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects EME-101/EME-201 and ECE-151/ECE-251 of the first year Engineering Programme along with the second year subjects.**

REVISED SYLLABUS & EVALUATION SCHEME

B.Tech. (Electronics and Communication Engineering)

[Effective from the session 2017-18]

Year-2nd, Semester-IV

S. No.	Subject Code	Subject	Periods			Evaluation Scheme				Subject Total	Credits
						Sessional Exam.			ESE		
			L	T	P	CT	Assig/ Att.	Total			
THEORY											
1.	EOE-040, to 049/ EAS-401	Science Based Open Elective/ Engg. Mathematics-III	3	1	0	20	10	30	70	100	4
2.	EAS-402/ EVE-401	Environment & Ecology/ Human Values & Professional Ethics	2	0	0	20	10	30	70	100	2
3.	EEC-401	Microprocessors & Microcontrollers	3	0	0	20	10	30	70	100	3
4.	EEC-402	Electromagnetic Field Theory	3	1	0	20	10	30	70	100	3
5.	EEC-403	Electronic Measurement & Instrumentation	3	0	0	20	10	30	70	100	4
6.	ECS-406	Data Structure & Algorithms	3	0	0	20	10	30	70	100	4
PRACTICAL / TRAINING / PROJECT											
7.	EEC-451	Microprocessors & Microcontrollers Lab	0	0	2	-	50	50	50	100	1
8.	EEC-452	Advanced Electronics System Lab	0	0	2	-	50	50	50	100	1
9.	EEC-453	Electronic Measurement & Instrumentation	0	0	2	-	50	50	50	100	1
10.	ECS-456	Data Structure & Algorithms Lab	0	0	2	-	50	50	50	100	1
First Year Engineering Programme for B.Tech. 2nd Year lateral entry students belonging to B.Sc. Stream											
11.	EME-201	Elements of Mechanical Engineering*	3	1	0	20	10	30	70	100*	-
12.	ECE-251	Computer Aided Engineering Graphics*	0	0	3	30	20	50	50	100*	-
		Total	**18**	**2**	**8**	**240**	**140**	**380**	**620**	**1000**	**24**

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List of Science Based Open Electives:

1. EOE030/040 Manufacturing Process
2. EOE031/041 Introduction to Soft Computing
3. EOE032/042 Nano Science
4. EOE033/043 Laser System and Application
5. EOE034/044 Space Science
6. EOE035/045 Polymer Science & Technology
7. EOE036/046 Nuclear Science
8. EOE037/047 Material Science
9. EOE038/048 Discrete Mathematics
10. EOE039/049 Applied Linear Algebra

EAS-301/EAS-401: ENGINEERING MATHEMATICS - III

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Unit - I

Function of Complex variable: Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem, Evaluation of real integrals of the type

Unit – II

Statistical Techniques: Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non–linear and multiple regression analysis, Binomial, Poisson and Normal distributions, Tests of significations: Chi-square test, t-test.

Unit – III

Numerical Techniques–I: Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

Unit – IV

Numerical Techniques–II: Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss- Seidel method. Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third and three-eight rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.

Unit – V

Numerical Techniques-III: Boundary Value Problem, Finite Difference Method, Eigen Value Problems, Condition Number, Polynomial Method, Power Method, Numerical solution of partial differential equations, Elliptic, parabolic and Hyperbolic equations.

OR

Integral Transforms: Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z- transform and its application to solve difference equations.

Test Books:

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger & Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi.
3. JN Kapur, Mathematical Statistics, S. Chand & company Ltd.
4. BS Grewal, Higher Engineering Mathematics, Khanna Publishers.

Reference Books:

1. RK Jain & SRK Iyenger, Advance Engineering Mathematics, Narosa Publication House.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt. Limited, New Delhi
4. E. Balagurusamy, Numerical Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi
5. T. Veerajan& T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, New Delhi.

EAS-302/EAS-402: ENVIRONMENT & ECOLOGY

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UNIT-I

Definition, Scope & Importance, Need For Public Awareness- Environment definition, Eco system - Balanced ecosystem, Human activities - Food, Shelter, Economic and social Security.

Effects or human activities on environment-Agriculture, Housing, Industry, Mining and Transportation activities, Basks of Environmental Impact Assessment. Sustainable Development.

UNIT-II

Natural Resources- Water Resources- Availability and Quality aspects. Water borne diseases, Water Induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles- Carbon, Nitrogen and Sulphur Cycles.

Energy - Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Biogas. Hydrogen as an alternative future source of Energy.

UNIT-III

Environmental Pollutlon and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management, e-waste management.

Current Environmental Issues of Importance: Population Growth, Climate Change and Global warming- Effects, Urbanization, Automobile pollution. Acid Rain Ozone Layer depletion, Animal Husbandry.

UNIT-IV

Environmental Protection- Role of Government, Legal aspects, initiatives by Non-Governmental organizations (NGO), Environmental Education, Women Education.

Text Books:

1. Environmental Studies-Benny Joseph-Tata McgrawHill-2005.
2. Environmental Studies- Dr. D.L. Manjunath, Pearson Education-2006.
3. Environmental Studies – R. Rajagopalan -Oxford Publication- 2005.
4. Text book of Environmental Science & Technology- M. Anji Reddy- US Publication.

Reference Books:

1. Principle of Environmental Science and Engineering - P. Venugoplan Rao, Prentice Hall of India.
2. Environmental Science and Engineering Meenakshi, Prentice Hall India.

EVE-301/EVE-401: HUMAN VALUES & PROFESSIONAL ETHICS

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UNIT-I: Course Introduction – Need, Basic Guidelines, Content and Process for Value Education.

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration – What is it? – Its content and process; 'Natural Acceptance' and Experiential Validation – As the mechanism for self exploration
3. Continuous Happiness and Prosperity – A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facilities – the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly – A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT-II: Understanding Harmony in the Human Being – Harmony in Myself?

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' – ***Sukh and Suvindha***
9. Understanding Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: ***Sanyam and Swasthya;*** correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure ***Sanyam and Swasthya*** – Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT-III: Understanding Harmony in the Family and Society – Harmony in Human – Human Relationship

13. Understanding harmony in the Family - the basic unit of human interaction
14. Understanding values in human – human relationship; meaning of Nyaya and program for its fulfillment to ensure ***Ubhay-tripti***; Trust (***Vishwas***) and Respect (***Samman***) as the foundational values of relationship
15. Understanding the meaning of ***Vishwas***; Difference between intention and competence
16. Understanding the meaning of ***Samman***, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): ***Samadhan, Samridhi, Abhay, Sah-astitiva*** as comprehensive Human Goals
18. Visualizing a universal harmonious order in society – Undivided Society (***Akhand Samaj***), Universal Order (***Sarvbhaum Vyawastha***) – from family to world family!
    – Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT-IV: Understanding Harmony in the Nature and Existence – Whole existence as Co-existence

19. Understanding the harmony in the Nature
20. Interconnectedness in the mutual fulfillment among the four orders of nature – recyclability and self-regulation in nature
21. Understanding Existence as Co-existence (***Sah-astitva***) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence – Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT-V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics:
    (a) Ability to utilize the professional competence for augmenting universal human order,
    (b) Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems,
    (c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to Universal Human Order:

(a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers,
(b) At the level of society: as mutually enriching institutions and organizations.

Text Book:

1. R. R. Gaur, R. Sangal, G.P. Bagaria, 2009, ***A Foundation Course in Value Education***.

Reference Books:

1. Ivan Illich, 1974, ***Energy & Equity***, The Trinity Press , Worcester, and HarperCollins, USA
2. PL Dhar, RR Gaur, 1990, ***Science and Humanism***, Commonwealth Purblishers.
3. A.N. Tripathy, 2003, ***Human Values***, New Age International Publishers.
4. E.G. Seebauer & Robert L. Berry, 2000, ***Fundamentals of Ethics for Scientists & Engineers***, Oxford University Press
5. M. Govindrajran, S. Natrajan & V.S. Senthil Kumar, ***Engineering Ethichs (including Human Values)***, Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, ***http://www.uptu.ac.in***
2. Story of Stuff, ***http://www.storyofstuff.com***
3. Al Gore, ***An Inconvenient Truth***, Paramount Classics, USA
4. Charlie Chaplin, ***Modern Times***, United Artists, USA
5. IIT Delhi, ***Modern Technology - The Untold Story***
6. Gandhi A., Right Here Right Now, Cyclewala Productions

EEE-305: NETWORK ANALYSIS & SYNTHESIS

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Unit - I

Signal Analysis, Complex Frequency, General Characteristics and Descriptions of Signals, Node Voltage Analysis, Mesh Current Analysis, Step Function and Associated Wave Forms, The Unit Impulse, Initial and final conditions, Step and Impulse Response, Response of Source Free Circuits, Forced Response, Phasor and Steady State Responses of Circuits to Sinusoidal Functions, Resonance in AC Circuits.

Unit – II

Review of Laplace Transforms, Poles and Zeroes, Initial and Final Value theorems, The transform circuit, Superposition Theorem, Thevenin's and Norton's theorems, Maximum Power Transfer Theorem, Convolution Integral, Amplitude and phase responses. Network functions.

Unit - III

Graph Theory fundamentals, Matrix Representation of Graphs, Formulation of Network Response Equations using Incidence Matrix, Duality in Networks. Computation of Ladder and Non-Ladder Networks, Routh-Hurwitz Stability Criterion, Bode Diagrams.

Unit – IV

Parameters of Two Port Networks, Correlation between Two Port Parameters, Two Port, Relation between Port Parameters, Transfer Functions using Two Port Parameters, Interconnection of TwoPorts , Reciprocal and Symmetric Networks, Terminated Two Port Networks, Interconnections of Two Port Networks, Image Impedance, Iterative Impedance. Harmonics and Dirichlet`s Conditions, Waveform Symmetry and Fourier Coefficients. Filter Networks.

Unit - V

Active Network Synthesis and Realizability: Elements of Relizability Theory, Hurwitz Polynomial, Positive Real Functions (PRF), Characteristics of PRF, Methodology for Simple Network Synthesis, Synthesis of Two Element Type One Port Network.

Text Books:

1. Franklin F. Kuo, "Network Analysis and synthesis", Wiley India Pvt Ltd.
2. M.S. Sukhija, T.K. Nagsarkar, "Circuits and Networks", Oxford University Publication.

Reference Books:

1. M. E. Van Valkenberg, “Network Analysis”, Prentice Hall of India Ltd.
2. Ghosh, “Network Theory: Analysis and Synthesis”, PHI Learning Pvt. Ltd.

EEC-301: DIGITAL LOGIC DESIGN

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Unit - I

DIGITAL SYSTEM AND BINARY NUMBERS: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don’t care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

Unit – II

COMBINATIONAL LOGIC: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

Unit - III

SEQUENTIAL LOGIC AND ITS APPLICATIONS: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

Unit - IV

SYNCHRONOUS & ASYNCHRONOUS SEQUENTIAL CIRCUITS: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

Unit – V

MEMORY & PROGRAMMABLE LOGIC DEVICES: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

1. M. Morris Mano and M. D. Ciletti, “Digital Design”, Pearson Education.
2. David J. Comer, “Digital Logic & State Machine Design”, Oxford University Press.
3. R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill Publication.

Reference Books:

1. D.P. Kothari and J.S. Dhillon, “Digital Circuits and Design”, Pearson Education.
2. A. Anand Kumar, “Fundamentals of Digital Circuits”, PHI Learning Pvt. Ltd.

EEC-302: ELECTRONICS DEVICES AND CIRCUITS

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Unit - I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism.
Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

Unit - II

Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions.
Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

Unit - III

MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

Unit - IV

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

Unit – V

Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.

Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Books:

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press.
2. Millman Jacob, Christos Halkias , Satyabrata Jit, "Electronic Devices and Circuits", Tata McGraw Hill.
3. B. G. Streetman and S. Banerjee "Solid State Electronics Devices", Prentice Hall of India.

Reference Books:

1. Donald A. Neamen "Semiconductor Physics & Devices", Tata McGraw Hill.
2. Alok K. Dutta, "Semiconductor Devices and Circuits", Oxford University Press.
3. Jacob Millman and Arvin Grabel, "Microelectronics", Tata McGraw Hill.

EEC-303: SIGNALS AND SYSTEMS

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Unit – I

Signals: Representation of Signals, Singularity Functions, Discrete Time Signals, Types of Signals, Time Scaling and Shifting, Convolution and Correlation of LTI Systems, Correlation of energy and power signals.

Unit – II

Systems and Analysis of System: System Classification, Linearity/Time Invariance, Causal System, Characterization of LTI Systems, Unit Sample Response, Generalization of D.T. Systems, Concept of Stability, Convolution Integrals/summations, Energy and Power spectral density, Properties of Power spectral Density, Analysis of First order systems, Analysis of second order systems

Unit – III

Fourier Transforms: Properties and Significance of CTFT, CTFT of Common Signals, Inverse CTFT; Introduction to DTFT, DTFT of Common Signals, Theorems and Properties – DTFT, Inverse DTFT; Continuous Time and Discrete Time Hilbert Transform and its Properties. Introduction of Gaussian signal and its Fourier transform.

Unit – IV

Laplace Transform and Z Transform: Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms; Z Transforms – Introduction, Z Transforms of Common Signals, Theorems and properties of Z Transforms, Inverse Z Transforms.

Unit – V

Sampling of Time Signals: Nyquist Criterion, Sampling theorem and frequency domain representation of sampling, Sampling Techniques, Reconstruction of band limited signal from its samples, Sampling of Sinusoidal and other signals.

Text Books:

1. A.V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'Signals and Systems', Pearson Education.
2. T.K. Rawat, "Signals and Systems", Oxford University Press.

Reference Books:

1. B.P. Lathi, "Principals of Linear Systems and Signals", Oxford University Press.
2. P. Ramakrishna Rao, 'Signal and System' Tata McGraw Hill, New Delhi.
3. Kishore S. Trivedi, "Probability & Statistics with Reliability Queuing and Computer Science Applications", Wiley Publication.

EEC-351: DIGITAL LOGIC DESIGN LAB

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List of Experiments:

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit's and other components.

EEC-352: ELECTRONIC DEVICES AND CIRCUIT LAB

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List of Experiments:

1. **Study of Lab Equipments and Components:** CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. **P-N Junction diode:** Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of V_{rms}, V_{dc}, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance..
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT:** BJT in CE configuration- Graphical measurement of h-parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. **Measurement of Operational Amplifier Parameters:** Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
8. **Applications of Op-amp:** Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
9. **Field Effect Transistors:** Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Oscillators:** Sinusoidal Oscillators-
    a. Wein's bridge oscillator
    b. phase shift oscillator.
11. Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

EEC-353: SIGNALS AND SYSTEMS LAB

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List of Experiments:

1. Introduction to MATLAB
   a. To define and use variables and functions in MATLAB.
   b. To define and use Vectors and Matrices in MATLAB.
   c. To study various MATLAB arithmetic operators and mathematical functions.
   d. To create and use m-files.
2. Basic plotting of signals
   a. To study various MATLAB commands for creating two- and three-dimensional plots.
   b. Write a MATLAB program to plot the following Continuous time and discrete time signals
      (i) Step Function (ii) Impulse Function
      (iii) Exponential Function (iv) Ramp Function
      (v) Sine Function
3. Time and Amplitude transformations
   a. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
   a. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
   a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
   b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
   a. To calculate Fourier Series coefficients associated with Square Wave.
   b. To Sum the first 10 terms and plot the Fourier Series as a function of time
   c. To Sum the first 50 terms and plot the Fourier Series as a function of time
7. Calculating transforms using MATLAB
   a. Calculate and plot Fourier Transform of a given signal
   b. Calculate and plot Z-transform of a given signal
8. Impulse response and Step response of a given system
   a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation
   b. Compute and plot the response of a given system to a given input
9. Pole-zero diagram and bode diagram
   a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function
   b. Write a MATLAB program to find, bode diagram of a given system from the given system function
10. Frequency response of a system
    a. Write a MATLAB program to plot magnitude and phase response of a given system
11. Checking Linearity/Non-Linearity of a system using SIMULINK
    a. Build a system that amplifies a sine wave by a factor of two.
    b. Test the linearity of this system using SIMULINK

References:

1. "Digital Signal Processing Using MATLAB" ,Vinay K. Ingle ,John G. Proakis, Cengage Learning
2. Mathworks Website www.mathworks.com/
3. Virtual Lab Website http://www.vlab.co.in/, http://iitg.vlab.co.in/?sub=59&brch=166

EEC-354: ELECTRONICS WORKSHOP & PCB DESIGN LAB

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0 0 2

List of Experiments:

1. Study of CRO, DMM & Function Generator.
2. Study of various types of Active & Passive Components based on their ratings.
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Introduction to PCB Design software

7. PCB Lab:
   a. Artwork & printing of a simple PCB.
   b. Etching & drilling of PCB.
8. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

EEC-401: MICROPROCESSORS & MICROCONTROLLERS

L T P
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Unit – I

8085 MICROPROCESSOR: History and Evolution of Microprocessor and their Classification, Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing modes, timing diagram of the instructions.

Unit – II

Hardware Interfacing with 8085: Methods of data Transfer and Interrupts of 8085 microprocessor: Classification of interrupts , Programming using interrupts ,Direct Memory Access, Serial and parallel data transfer, Interfacing of Memory Chips with 8085 Microprocessor, Interfacing of 8085 with 8155/8156 (RAM), 8355/8755 (ROM). Interfacing of Programmable Devices with 8085 Microprocessor, 8279 programmable Keyboard/Display interface, 8255A programmable Parallel interface, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Assembly language programming

Unit – III

16-bit low power MCU MSP430: Introduction to microcontrollers and embedded systems, Von Neumann (Princeton) and Harvard architecture, RISC and CISC machine, Introduction to MSP430: Architecture, Programming Techniques, Addressing Modes, Programming System registers and configuration I/O ports pull up/down registers concepts, Low Power aspects of MSP430: low power modes, Active vs Standby current consumption

Unit – IV

Configuring Peripherals in MSP430: External interrupts and software interrupt, interrupt programming, Watchdog timer, Clock Tree in MSP430, Timer/ counter interrupt, Programming MSP430 timer, counter programming, Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA

Unit – V

Serial Communication Interfaces in MSP430: Basics of serial communication, mode of serial communication, RS232, serial communication issue, Serial port programming. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices, external memory, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor Interfacing and signal conditioning .

Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: “A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID

Text Books:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, Penram International Publication (India) Pvt. Ltd.
2. D. V. Hall, “Microprocessors Interfacing”, Tata McGraw Hill Publication.
3. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press Publication.
4. Getting Started with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880
5. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763

Reference Books:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training
3. A. K. Roy & K. M. Bhurchandi , “Advance Microprocessor and Peripherals (Architecture, Programming & Interfacing)” Tata McGraw Hill Publication

EEC-402: ELECTROMAGNETIC FIELD THEORY

L T P
3 1 0

Unit – I

Coordinate Systems and Transformation:
Basics of Vectors: Addition, subtraction and multiplications; Cartesian, Cylindrical, Spherical transformation.
Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

Unit – II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

Unit – III

Magneto statics: Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

Unit – IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

Unit – V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book:

1. M.N.O. Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Book:

2. W.H.Hayt and J.A.Buck, "Engineering Electromagnetic", McGraw- Hill Education.

EEC-403: ELECTRICAL MEASUREMENT AND INSTRUMENTATION

L T P
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Unit – I

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimensions and standards.
Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, Galvanometer, DC ammeter, DC voltmeter, series ohm meter.

Unit – II

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes, Digital voltmeter systems, Digital multimeter, digital frequency meter System

Unit – III

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, Low Resistance Measuring Instruments, AC bridge theory, capacitance bridges, Inductance bridges, Q meter

Unit – IV

CRO: CRT, Wave Form Display, Time Base, Dual Trace Oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications

Unit – V

Instrument calibration: Comparison method, digital multimeter as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters Transducers

Text Book:

1. David A. Bell, "Electronic Instrumentation and Measurements", Oxford University Press.

Reference Books:

1. Oliver and Cage, "Electronic Measurements and Instrumentation", Tata McGraw Hill Publication.
2. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann).

ECS-406: DATA STRUCTURE & ALGORITHMS

L T P
3 0 0

Unit – I

Abstract Data Types, Sequences as value definitions, Data types in C, Pointers in C, Data Structures and C, Arrays in C, Array as ADT, One Dimensional Array, Implementing one Dimensional Array, Array as parameters, Two Dimensional Array, Structures in C, Implementing Structures, Unions in C, Implementation of unions, Structure Parameters, Allocation of storage and scope of variables, Recursive Definition and Processes: Factorial Function, Fibonacci Sequence, Recursion in C, efficiency of Recursion, Hashing: Hash Function, Open Hashing, Closed Hashing: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit – II

Stack, Queue And Linked List: Stack definition and examples, Primitive Operations, Example Representing Stacks in C, Push And Pop Operation Implementation, Queue as ADT, C Implementation of Queues, Insert Operation, Priority Queue, Array Implementation of Priority Queue, Inserting and Removing Nodes from a list-linked Implementation of stack, Queue and Priority Queue, Other List Structures, Circular Lists: Stack and Queue as Circular List -Primitive Operations on circular lists, Header Nodes, Doubly Linked Lists, Addition of Long Positive Integers on Circular and Doubly Linked List.

Unit – III

Trees: Binary trees: Operations on Binary Trees, Applications of Binary Trees, Binary Tree Representation, Node Representation of Binary Trees, Implicit Array Representation of Binary Tree, Binary Tree Traversal in C, Threaded Binary Tree, Representing List as Binary Tree, Finding the Kth element, Deleting an Element**, Trees and their applications:** C Representation of trees, Tree Traversals, Evaluating an Expression Tree, Constructing a Tree.

Unit – IV

Sorting And Searching: General Background of Sorting: Efficiency Considerations, Notations, Efficiency of Sorting, Exchange Sorts: Bubble Sort; Quick Sort; Selection Sort; Binary Tree Sort; Heap Sort, Heap as a Priority Queue, Sorting Using a Heap, Heap Sort Procedure, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge Sort, Radix Sort, Sequential Search: Indexed Sequential Search, Binary Search, Interpolation Search.

Unit – V

Graphs: Application of Graph, C Representation of Graphs, Transitive Closure, Warshall's Algorithm, Shortest Path Algorithm, Linked Representation of Graphs, Dijkstra's Algorithm, Graph Traversal, Traversal Methods for Graphs, Spanning Forests, Undirected Graph and their Traversals, Depth First Traversal, Application of Depth First Traversal, Efficiency of Depth First Traversal, Breadth First Traversal, Minimum Spanning Tree, Kruskal's Algorithm, Round Robin Algorithm.

Text Books:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, "Data structures using C and C++", Pearson Education.
2. Reema Theraja, "Data Structure using C", OUP Publication.

References Books:

1. E. Balagurusamy, "Programming in ANSI C', Second Edition, Tata McGraw Hill Publication.

2. Robert L. Kruse, Bruce P. Leung Clovis L. Tondo, “Data Structures and Program Design in C”, Pearson Education.
3. Lipschutz, “Data Structures With C”, Tata McGraw-Hill Education.
4. T.H. Koreman, “Introduction to Algorithms“, MIT Press.

EEC-451: MICROPROCESSOR AND MICROCONTROLLERS LAB

L T P
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List of Experiments:

1. To study 8085 microprocessor system.
2. i) Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
   ii) Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
   iii) To perform multiplication and division of two 8 bit numbers using 8085.
3. Learn and understand how to configure MSP-EXP430G2 Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, push buttons interface).
   Exercises:
   a) Modify the delay with which the LED blinks.
   b) Modify the code to make the green LED blink.
   c) Modify the code to make the green and red LEDs blink:
      i. Together
      ii. Alternately
   d) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.
   e). Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.
   f). Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.
4. Usage of Low Power Modes:
   Configure the MSP-EXP430G2 Launchpad for Low Power Mode (LPM3) and measure current consumption both in active and low power modes. Use MSPEXP430FR5969 as hardware platform and measure active mode and standby mode current.
   Exercises:
   a) How many Low power modes are supported by the MSP430G2553 platform?
   b) Measure the Active and Standby Current consumption in LPM3 mode for the same application using MSP430F5529 LaunchPad
5. Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.
   Exercises:
   a) Write the code to enable a Timer interrupt for the pin P1.1.
   b) Write the code to turn on interrupts globally
6. Implement Pulse Width Modulation to control the brightness of the on-board, green LED. This experiment will help you to learn and understand the configuration of PWM and Timer peripherals of the MSP430G2553.
   Exercises:
   a) Observe the PWM waveform on a particular pin using CRO.
   b) What is the maximum resolution of PWM circuitry in MSP430G2 Launchpad?
   c) Change the above code to create a PWM signal of 75% duty cycle on particular PWM pin.
7. The main objective of this experiment is to control the on-board, red LED by the analog input from a potentiometer. This experiment will help you to learn and understand how to configure an ADC to interface with a potentiometer.
   Exercises:
   a) Alter the threshold to 75% of Vcc for the LED to turn on.
   b) Modify the code to change the Reference Voltage from Vcc to 2.5V.
8. Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 Launchpad to control the DC motor using external analog input.
   Exercises:
   a) What is the maximum resolution of PWM circuitry in MSP430G2 LaunchPad and how it can be achieved using program?

b) Create a PWM signal of 75% duty cycle on particular PWM pin.
c) Create Switch case code from the example code to run the DC Motor in 3 set of speeds.

9. Understand the ULP Advisor capabilities and usage of ULP Advisor to create optimized, power-efficient applications on the MSP-EXP430G2 Launchpad.

   Exercises:

   a) How does the ULP Advisor software help in designing power-optimized code?
   b) Which ULP rule violation helps us to detect a loop counting violation?
   c) Connect the MSP430 to terminal on PC and echo back the data

10. Configure of Universal Serial Communication Interface (USCI) module of MSP430G2553 for UART based serial communication. The main objective of this experiment is to use UART of the MSP430G2553 to communicate with the computer.

    Exercise:

    Modify the above code to transmit the set of strings to the serial terminal via UART as shown below:

    char str1[]="MSP430G2 launchpad"
    char str2[]= "Ultra low power mixed signal processing applications"

11. Understand and Configure 2 MSP430F5529 Launchpads in master-slave communication mode for SPI protocol.

    Exercises:

    a) Which port pins of MSP430 can be configured for SPI communication?
    b) What is the data transfer rate supported by MSP430 for SPI communication?

EEC-452: ADVANCE ELECTRONICS SYSTEM LAB

L T P
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List of Experiments:

Transistor Modeling and Circuits

- Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)
  - *DC biasing of Common Source
  - *MOSFET Common Source Amplifier
  - *MOSFET Source Follower
  - *Current Mirror
- SPICE parameters for MOSFET transistors.
- Step-Down (Buck) DC-DC Converters.
- Step-Up (Boost) DC-DC Converter
- CMOS Amplifier design.

Timing

- MOSFET based Ring oscillators
- MOSFET based Relaxation oscillators
- MOSFET based Voltage-controlled oscillators
- Integration of crystal oscillator into circuits

Data Conversion

- Analog to Digital Conversion
  - * Successive Approximation ADC
- Digital to Analog Conversion
  - * Scaled Resistor Network

System Considerations

- System-level stability: decoupling, ground loops
- Basics of EMC and screening
- Examples of complete electronic systems

EEC-453: ELECTRONIC MEASUREMENT AND INSTRUMENTATION LAB

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List of Experiments:

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given scillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv) Pressure transducer
6. Measurement of phase difference and frequency using CRO (Lissajous Figure)
7. Measurement of low resistance Kelvin's double bridge.
8. To measure unknown capacitance of small capacitors by using Schering's bridge.
9. To measure unknown Inductance using Hay's bridge.
10. To measure unknown frequency using Wein's frequency bridge.

ECS-456: DATA STRUCTURE AND ALGORITHMS LAB

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List of Experiments:

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
    a. Searching (Linear Search, Binary Search)
    b. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
    c. Merging
4. Implementation of Link List
    a. Creation of Singly link list, Doubly Linked list
    b. Concatenation of Link list
    c. Insertion and Deletion of node in link list
    d. Splitting the link list into two link list
5. Implementation of STACK and QUEUE with the help of
    a. Array
    b. Link List
6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
7. Write a program to simulate various traversing Technique
8. Representation and Implementation of Graph
    a. Depth First Search
    b. Breadth First Search
    c. Prim`s Algorithm
    d. Kruskal`s Algorithms
9. Implementation of Hash Table

SCIENCE BASED OPEN ELECTIVES

EOE-030/EOE-040: MANUFACTURING PROCESS

Unit- I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications.

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep.

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel.

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Alalloys.

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube - drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications. Hot-working versus cold - working.

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses.

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding.

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses.

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity.

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials.

Misc. Processes: Introduction to Galvanizing and Electroplating.

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI.
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson.
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson.
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital, New Age.

EOE-031/EOE-041: INTRODUCTION TO SOFT COMPUTING

Unit- I

Neural Networks-I (Introduction &Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multiplayer feed forward networks recurrent networks. Various learning techniques; Perception and convergence rule.

Auto-associative and hetro-associative memory.

Unit- II

Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multiplayer perception model; back propogation learning methods, effect of learning rule co-efficient back propagation algorithm, factors affecting back propagation training, applications.

Unit- III

Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic. Fuzzy sets and Crisp sets Fuzzy set theory and operations Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit- IV

Fuzzy Logic-II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzifications, Fuzzy Controller, Industrial applications.

Unit- V

Genetic Algorithm (GA)

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

Text Books:

1. S. Rajsekaran & G A. Vijayalakshmi Pal, “Neural Networks Fuzzy Logic and Genetic Algorithm Synthesis and Applications" Prentice Hall of India.
2. N.P. Pady, "Artificial Intelligence and Intelligent Systems" Oxford University Press.

Reference Books:

3. Siman Hykin, "Neural Networks' Trentice Hall of India.
4. Timothy J Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" Tata Me Graw Hill.

EOE-032/EOE-042: NANO SCIENCE

UNIT-I

Introduction: Definition of Nano-Science and Nano Technology, Applications of Nano-Technology.

Quantum Theory for Nano Science: Particle in a box, Potential step: Reflection and tunneling (Quantum leak). Penetration of Barrier, Potential box (Traped particle in 3D: Nanodot).

Physics of Solid State Structures: Size dependence of properties, crystal structures, face centered cubic nanoparticles; Tetrehedrally bounded semiconductor structures; lattice vibrations.

Energy Bands: Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors; effective masses; Fermi Surfaces.

Localized Particles: Acceptors and deep taps; mobility; Excitons.

UNIT-II

Quantum Nanostructure: Preparation of quantum wells, Wires and Dots, Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Single electron Tunneling, Infrared detectors; Quantum dot laser superconductivity.

Properties of Individual Nano Particles: Metal nano clusters; Magic numbers; Theoretical modeling of nanoparticles; geometric structure; electronic structure; Reactivity, Fluctuations, Magnetic clusters; Bulk to nanostructure, semiconducting nanoparticles, Optical Properties, Photofragmentation, Coulombic Explosion. Rare Gas & Molecular clusters; Inert gas clusters; Superfluid clusters; Molecular clusters.

UNIT-III

Growth Techniques of Nanomaterials: Litho and Nonlithograpahic techniques, RF Plasma, Chemical methods, Thermolysis, Pulsed laser method, Self-assembly, E-beam evaporation, Chemical Vapour Deposition, Pulsed Laser Deposition.

UNIT-IV

Methods of Measuring Properties: Structure: X-ray Diffraction Technique, Particle size determination, surface structure. Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy(TEM). Spectroscopy: Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luminescence.

UNIT-V

Carbon Nano Materials: Bucky Ball and Carbon Nano- Tubes: Nano structures of carbon (fullerene), Fabrication, Structure. Electrical, Mechanical and Vibrational properties and applications. Nano Diamond, Boron Nitride Nano-tubes, Single Electron Transistors, Molecular Machine, Nano-Biometrics, Nano Robots.

Text/Reference Books:

1. C.P. Poole Jr F.J. Owens, “Introduction to Nanotechnology”.
2. C.Kittel “Introduction to S.S. Physics”-(7th Edn.) Wiley 1996.
3. H.S. Nalwa “Handbooke of Nanostructured Materials & Nanotechnology” vol. 5. Academic Press 2000.

EOE-033/EOE-043: LASER SYSTEMS AND APPLICATIONS

UNIT-I

Basic Principle of Modern Physics: Black body radiation, Atomic structure, Spectral series of hydrogen atom, Polarization, Absorption and florescence of X-ray, Energy distribution in electrons, Probability of distribution of free electrons, Free electron in metals, Energy level in free electrons, Application of Schrodinger equation in potential well, potential step, tunneling effect.

UNIT-II

Elements and Techniques of Laser: Concept of coherence, Temporal and Spatial coherence, Coherence length and time, Brightness and Intensity, Directionality and Monochromacity. Absorption, Spontaneous and Stimulated Emission process and Einstein’s coefficients. Population inversion, Pumping and pumping schemes, laser gain, Optical cavities and its types.

UNIT-III

Principle of Laser & General Lasers: Main components of Laser, Principle of Laser action, Introduction to general lasers and their types. Three & four level Lasers, Continuous Wave Lasers, Pulsed Lasers, Q-switch lasers.

UNIT-IV

Types of Laser Systems:

Solid state Lasers: Neodymium laser, Nd-Yag laser, Nd-Glass laser and Alexandrite laser.

Liquid Lasers: Dye laser, Tuning in Dye laser, Model-Locked Ring Dye laser.

Gas Laser: Ionic lasers, Argon ion laser, Krypton ion laser, He-Cadmium laser, Copper vapour laser, Carbon dioxide laser and Excimers laser.

Semiconductor Laser: Characteristics of semiconductor lasers, Semiconductor diode lasers, Hetrojunction lasers, Homojunction lasers, Quantum well lasers.

UNIT-V

Laser Applications:

Material Processing: Material processing with lasers, Interaction mechanism, Material processing mechanism, Drilling, Cutting and Welding process with laser. Laser hardening.

Medical Science: Medical lasers, Laser diagnostic, Laser in ophthalmology, laser in glaucoma, Laser for general surgery, Laser in dermatology, laser in dentistry, Laser in medicine.

Optical Communication: Optical source for fiber optical communication, powering and coupling, Transmission, Hologram their characteristics. LIDAR.

Reference Books:

1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International.
2. S.A. Ahmad, "Laser concepts and Applications" New Age International.
3. A.K. Katiyar, C. K. Pandey and Manisha Bajpai, Fundamentals of Laser Systems and Applications.

EOE-034/EOE-044: SPACE SCIENCE

UNIT-I

Introduction: Important Individual Contributions [Pre Telescopic: Ptolemy, Copernicus, Brahe and Keplar. Post Telescopic Era: Galileo, Newton, Hubble, Gauss, Riemann, Einstein and Hawkins]. Various International Organizations involved in the development of space Science (NASA, ESA, ISRO).

UNIT-II

Space Observations: Problems related to Eye and Atmosphere and their Remedies, Distance in Space and Magnitude, Measurement Techniques, Non-Optical Telescopic Techniques used in space observation (Covering entire Electromagnetic Region).

UNIT-III

Solar System: Nebular theory of formation of our Solar System. Sun-its origin and fate, Source of Energy and Solar wind. Brief description of Planets about shape, size, period of rotation about axis and period of revolution, distance of planets from sun. Bode's law, Keplar's Laws of planetary motion, Newton's deductions from Kepler's Laws, Newton's Law of gravitation, correction of Kepler's third law. Determination of mass of Earth, Determination of mass of planets with respect to earth. Brief description of Asteroids, Satellites and Comets.

UNIT-IV

Stars and Galaxy: Stellar Evaluation and Stellar Remnants, Nucleo-Synthesis and Formation of Elements. Classification of Stars: Harvard classification system, Hertzsprung- Russel Diagram, Luminosity of star, variable stars; composite stars (white dwarfs, Neutron stars, black hole, star clusters, supernova and binary stars); Chandrasekhar limit. Galaxies: Galaxies and their evolution and origin, active galaxies and quasars.

UNIT-V

Cosmology: Hubble Law, Redshift and Expansion of the Universe, Cosmic Microwave, Background Radiations, Matter density in Universe, Cosmological principle, Important Models of Universe (Steady State and Big Bang), Dark Matter and Dark Energy.

Text Books / Reference Books:

1. Baidyanath Basu, T. Chattopadhyay, S.N. Biswas " An Introduction to Astrophysics" PHI 2nd Edition.
2. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International.

EOE-035/EOE-045: POLYMER SCIENCE AND TECHNOLOGY

UNIT-I

Basic Concepts of Polymers: A brief History, what are polymer, how are polymers made, Classification of polymers

UNIT-II

Chemistry of Polymerization: Introduction, Chain polymerization, step growth polymerization. Miscellaneous Polymerization reactions. polymerization Techniques.

UNIT-III

Molecular Weight and Size: Average molecular weight, Number average and weight average molecular weight. Sedimentation and viscosity-average molecular weight. Molecular weight and degree of polymerization. Polydispersity and molecular weight distribution in polymers. Practical significance of polymer molecular weight. Size of polymer molecules.

UNIT-IV

Polymer Degradation: What is polymer degradation, types or degradation, thermal and mechanical degradation, Degradation by ultrasonic waves. photodegradtion, degradation by high energy radiation, oxidative degradation, hydrolytic degradation.

UNIT-V

Preparations and Applications: Preparation, properties and technical applications of thermoplastics, thermosetting, elastomer and synthetic fibres. Silicones. Applications of polymers in aerospace, ocean, electronics, medical, agriculture, automobile, Sports and building constructions.

EOE-036/EOE-046: NUCLEAR SCIENCE

UNIT-I

Nucleus and Its Basic Features: Nuclear structure, Nuclear forces and their properties, Nuclear binding energy, Nuclear stability, Nuclear radius and its measurement, Nuclear spin, Nuclear magnetic and Electrical moments.

UNIT-II

Nuclear Models: Single particle model, Liquid drop model and Semi-Emperical mass formula, Nuclear potential and Shell model, Collective model.

UNIT-III

Nuclear Reaction: Nuclear reaction and Laws of conservation, Types of nuclear reaction, Mechanism of nuclear reaction-Q value, Nuclear fission and their explanation by liquid drop model, Nuclear fusion and its applications.

UNIT-IV

Radioactivity: Radioactive disintegration, Decay constant, Half life period and Mean life, Alpha decay, Beta decay, Gamma decay, Interaction of nuclear radiation with matter.

UNIT-V

Accelerators: Mass spectrograph: General principle, Aston's Mass Spectrograph Van de Graph Generator, Cyclotron and Synchrotron.

Detectors: G M Counter, Scintillation counter, cloud chamber, Bubble Chamber, production and detection of neutrons and Gamma-photon.

Application of Nuclear Techniques: Nuclear magnetic resonance, positron emission topography, radiotracer techniques and applications in material science and agriculture.

Reference Books:

1. Tayal, “Nuclear Physics” Himalaya Publishing House.
2. S.N. Ghosal, “Nuclear Physics” S. Chand & Co.
3. S. B. Patel, “Nuclear Physics: An Introduction New Age International.
4. H. B. Lal, “Introductory Nuclear Physics” United Book Depot.
5. Wang, “Introductory Nuclear Physics”, PHI Learning
6. Roy & Nigam, “Nuclear Physics” John Wiley & sons.

EOE-037/EOE-047: MATERIAL SCIENCE

UNIT-I

Introduction: Historical perspective, importance of materials, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bonding.

Crystallography and imperfections: Concept of unit cell, space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques, imperfections, Defects & Dislocations in solids.

UNIT-II

Mechanical Properties and Testing: Stress strain diagram, Ductile and brittle materials, stress Vs strength, toughness, hardness, fracture, fatigue and creep. Testing, such as Strength testing, Hardness testing, Impact testing, Fatigue testing Creep testing, Non-destructive testing (NDT).

Micro Structural Exam: Microscope principle and methods, Preparation of samples and micro structure exam and grain size determination, comparative study of microstructure of various metals and alloys, such as Mild steel, CI, Brass.

Phase Diagram and Equilibrium Diagram: Unitary and Binary diagrams, Phase rules, Types of equilibrium diagrams: solid solution type, eutectic type and combination type, Iron-carbon equilibrium diagram.

UNIT-III

Ferrous materials: Iron and steel manufacture, furnaces, various types of carbon steels, alloy steels and cast irons, its properties and uses.

Heat Treatment: various types of heat treatment, such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.

Non-Ferrous metals and alloys: Non-ferrous metals, such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various types of Brass, Bronze bearing materials their properties and uses. Aluminum alloys, such as Duralumin, Other advanced materials/alloys.

UNIT-IV

Magnetic properties: Concept of magnetism-Dia, para, ferro magnetic materials, Hysteresis, Soft and hard magnetic materials, Magnetic Storages.

Electric Properties: Energy band, concept of conductor, insulator and semi conductor. Intrinsic and extrinsic semi-conductors, P-n junction and transistors, Basic devices and their applications, diffusion of Solid. Super conductivity and its applications, Messier effect. Type I & II superconductors. High Temp. superconductors.

UNIT-V

Ceramics: Structure, types, properties and applications of ceramics. Mechanical/Electrical behavior and processing of ceramics.

Plastics: Various types of polymers/plastics and their applications. Mechanical behavior and processing of plastics, Future of plastics.

Other Materials: Brief description of other materials, such as optical and thermal materials, concrete, composite materials and their uses.

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Performance of materials in service: Brief theoretical consideration of fracture, fatigue, and corrosion and its control.

Text / Reference Books:

1. W.D. Callisster Jr. “Material Science & Engineering Addition”-Wesly Publishing Co.
2. Van Vlash, “Elements of Material Science & Engineering”, John Wiley & Sons
3. V. Raghvan, “Material Science”, Prentice Hall of India
4. Narula, “Material Science”, Tata Mc.Graw Hill
5. Srivastava, Srinivasan, “Science of Materials Engineering” New Age International.

EOE-038/EOE-048: DISCRETE MATHEMATICS

UNIT-I

Relation: Definition, types of relation, composition of relations, pictorial representation of relation, properties of relation, partial order relation.

Function: Definition and types of functions, composition of functions, recursively defined functions.

Group: Monoid, Semi-group, Abelian Group, Properties of groups, Cyclic Group, Permutation groups, Caley’s Theorem, Rings and Fields (definition, examples and standard results)

UNIT-II

Propositional logic: Introduction to logic, logical connectives, truth tables, Tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification.

Notion of proofs: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

UNIT-III

Combinatorics: Mathematical induction, recursive mathematical definitions, basics of counting, Cardinality and Countability, Pigeonhole principle, permutations, combinations, inclusion-exclusion.

UNIT-IV

Recurrence relations (n^{th} order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function, properties of generating functions (G.F.), Solution of recurrence relation using G.F, solution of combinatorial problem using G.F.

UNIT-V

Graphs: Graph terminology, types of graph, connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number.

Tree: Definition, types of tree (rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, postorder).

Text/Reference Books:

1. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Mc.Graw Hill, 2002.
2. J.P.Tremblay& R. Manohar, “Discrete Mathematical Structure with Applications to Computer Science” Mc.Graw Hill, 1975.
3. V. Krishnamurthy, “Combinatories:Theory and Applications”, East-West Press.
4. Seymour Lipschutz, M.Lipson, “Discrete Mathemataics” Tata McGraw Hill, 2005.
5. Kolman, Busby Ross, “Discrete Matheamatical Structures”, Prentice Hall International.

EOE-039/EOE-049: APPLIED LINEAR ALGEBRA

UNIT-I

Fields, Vector-spaces, sub-spaces, linear-combination, linear-dependence and independence. Basis and dimensions (each and every fact to be illustrated by suitable examples).

UNIT-II

Linear-transformation, definition and examples, matrix representation, similarity, range and kernel, rank-nullity theorem and its consequences.

UNIT-III

Singular and non-singular linear transformations, sum and product of linear transformations, vector space of linear transformations, nilpotent linear transformations.

UNIT-IV

Inner product spaces, definition and examples, orthogonality, Cauchy-Schwartz Inquality, Minkowski Inequality, polarization Identity, complete orthonormal set, Bessel's Inequality, Gram-Schmidt's orthogonalization process.

UNIT-V

Linear functional, definition and examples, vector space of linear functional, dual vector spaces, adjoint, self adjoint, unitary and normal operators, examples and properties, eigen values and eigen vectors, diagonalisation of linear operators, quadratic forms, principle axis theorem(without proof), some applications to engineering problems.

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