# J. S. UNIVERSITY, SHIKOHABAD

# B.TECH

3<sup>rd</sup> Semester& 4<sup>th</sup>Semester
(Electronics& Comm. Engineering)

# SCHEME
# &
# SYLLABUS

[ Effective from the session 2015-16 ]

# B.Tech (Electronics Engineering).

SEMESTER - THIRD

| S.No. | Subject Code | Name of Subject | Periods Per Week | | | | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | D | Sessional | End Exam | Total | Duration |
| **THEORY SUBJECT** | | | | | | | | | | |
| 1 | BTAS-31 | Engg Mathematics-III | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 2 | BTEC-31 | Network Analysis & Synthesis | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 3 | BTEC-32 | Fundamental of Electronic Devices | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 4 | BTEC-33 | Signals and Systems | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 5 | BTEC-34 | Switching Theory & Logic Design | 4 | 1 | - | - | 25 | 50 | 75 | 2 |
| 6 | BTIP-31 | Industrial Psychology | 4 | 1 | - | - | 25 | 50 | 75 | 2 |
| 7 | BTAC-31 | Human Value & Professional Ethics* | 2 | - | - | - | 25 | 50 | 75 | 2 |
| **PRACTICA/DRAWING SUBJECTS** | | | | | | | | | | |
| 8 | BTEC-31P | Network Analysis & Synthesis Lab. | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 9 | BTEC-35P | Electronics Workshop & PCB Design | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 10 | BTEC-34P | Logic Design Lab. | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 11 | BTEC-32P | Electronic Device Lab. | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 12 | BTGD-30 | Games//Social and Cultural Activities + Discipline ( 25 + 25) | | | | | | | 50 | |
| | | | | | | | | Grand Total | 1000 | |

*Human values & Professional Ethics will be offered as a compulsory audit course for which passing marksare 30% in End Semester Examination and 40% in aggregate.

NOTE:- (1) Each period will be 50 minutes duration.

(2) Each session will be of 16 weeks.

(3) Effective teaching will be at least 14 weeks.

(4) Remaining periods will be utilised for revision etc.

# B.Tech (Electronics Engineering).

SEMESTER - FOURTH

| S.No. | Subject Code | Name of Subject | L | T | P | D | Sessional | End Exam | Total | Duration |
|-------|-------------|-----------------|---|---|---|---|-----------|----------|-------|----------|
| | | | \multicolumn{4}{Periods Per Week} | \multicolumn{4}{Evaluation Scheme} | |
| **THEORY SUBJECT** | | | | | | | | | | |
| 1 | BTOE-41-BTOE-49 | Science Based Open Elective | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 2 | BTCS-45 | Data Structure | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 3 | BTEC-41 | Electronic Circuits | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 4 | BTEC-42 | Electronic Measurements & Instrumentation | 4 | 1 | - | - | 50 | 100 | 150 | 3 |
| 5 | BTEC-43 | Electromagnetic Field Theory | 4 | 1 | - | - | 25 | 50 | 75 | 2 |
| 6 | BTIS-41 | Industrial Sociology | 4 | 1 | - | - | 25 | 50 | 75 | 2 |
| 7 | BTAC-41 | Cyber Security* | 2 | - | - | - | 25 | 50 | 75 | 2 |
| **PRACTICA/DRAWING SUBJECTS** | | | | | | | | | | |
| 8 | BTCS-45P | Data Structure Lab. | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 9 | BTEC-41P | Electronic Circuits Lab | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 10 | BTEC-44P | Digital Electronics Lab. | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 11 | BTEC-42P | Electronics Measurement Lab | - | - | 2 | - | 20 | 30 | 50 | 3 |
| 12 | BTGD-40 | Games//Social and Cultural Activities + Discipline ( 25 + 25) | | | | | | | 50 | |
| | | | | | | | | Grand Total | 1000 | |

*Cyber Security will be offered as a compulsory audit course for which passing marksare 30% in End Semester Examination and 40% in aggregate.

# List of Open Electives for B. Tech. Courses
## SCIENCE BASED OPEN ELECTIVE

| | |
|---|---|
| BTOE-041 | Introduction to Soft Computing (Neural Networks, Fuzzy Logic and Genetic Algorithm) |
| BTOE-042 | Nano Sciences |
| BTOE-043 | Laser Systems and Applications |
| BTOE-044 | Space Sciences |
| BTOE-045 | Polymer Science & Technology |
| BTOE-046 | Nuclear Science |
| BTOE-047 | Material Science |
| BTOE-048 | Discrete Mathematics |
| BTOE-049 | Applied Linear Algebra |

# [BTAS-31]Engg Mathematics-III

**Unit – I: Function of Complex variable**

Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy'sintegral 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: Integral Transforms**

Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems,Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensionalheat transfer equations, wave equations and Laplace equationsZ- transform and its application to solve difference equations.

**Unit – III: Statistical Techniques**

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

**Unit – IV: Numerical Techniques – I**

Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi methodand Newton-Raphson method, Rate of convergence of above methods.

**Interpolation:** Finite differences, Newton's forward and backward interpolation, Lagrange's andNewton's divided difference formula for unequal intervals**.**

**Unit – V: Numerical Techniques –II**

Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss-Seidal method.Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third andthree-eight rules,Solution of ordinary differential equations (first order,second order and simultaneous) byEuler's, Picard's and fourth-order Runge- Kutta methods.

**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

**Reference Books:-**

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House,.

2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.

# [BTEC-31]Network Analysis & Synthesis

**UNIT-1**
Signal analysis, complex frequency, network analysis, networksynthesis, General characteristics and descriptions of signals,step function and associated wave forms, The unit impulseIntroduction to network analysis, network elements, initial andfinal conditions, step and impulse response, solution of networkequations.

**UNIT-2**
Review of Laplace transforms, poles and zeroes, initial and finalvalue theorems, The transform circuit, Thevenin's and Norton'stheorems, the system function, step and impulse responses, theconvolution integral. Amplitude and phase responses.Network functions, relation between port parameters, transferfunctions using two port parameters, interconnection of twoports.

**UNIT-3**
Hurwitz polynomials, positive real functions.Properties of real immittance functions, synthesis of LC drivingpoint immittances, properties of RC driving point impedances,synthesis of RC impedances or RL admittances, properties ofRL impedances and RC admittances.

**UNIT-4**
Properties of transfer functions, zeroes of transmission,synthesis of Y21 and Z21 with 1Ω terminations.

**UNIT-5**
Introduction to active network synthesisActive Network Synthesis

**Text Book:**
**1.** Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
**2.** Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

**Reference Books:** M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
Ghosh-Network Theory: Analysis and Synthesis, PHI Learning Pvt. Ltd

# [BTEC-32]Fundamental of Electronic Devices

**UNIT-1**

Crystal Properties and charge Carriers in Semiconductors:Elemental and compound semiconductor materials, crystallattice structure,Bonding forces and energy bands in solids, charge carriersin semiconductors, carrier concentrations, drift of carriersin electric and magnetic fields.

**UNIT-2**

Excess Carriers in Semiconductors: Optical absorption,luminescence, carrier life time and photo conductivity,diffusion of carriers.

**UNIT-3**

Junction Properties: Equilibrium conditions, biasedjunctions, steady state conditions, reverse bias break down,transient and AC conditions.Metal semiconductor junctions.

**UNIT-4**

Transistors: Metal-semiconductor-field-effect-transistors(MESFET), Metal-insulator-semiconductor-field-effecttransistors(MISFET), Metal oxide semiconductor fieldeffect transistor (MOSFET): Construction, Operation andcharacteristics of above devices.Bipolar junction transistors: Fundamentals of BJToperation, amplification with BJTs.

**UNIT-5**

Some special devices:Photodiodes, photo detectors, solar cell, light emittingdiodes, semi-conductor lasers, light emitting materials.Tunnel Diode: degenerate semiconductors,IMPATT diode;The transferred electron mechanism: The GUNN diode.P-N-P-N diode, semiconductor controlled rectifier (SCR),bilateral devices: DIAC, TRIAC, IGBT.

**Text Book:** B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.

**Reference Books**:1. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press.
2. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.

# [BTEC-33]Signals and Systems

**UNIT-1**
**Signals**: Definition, types of signals and their representations:continuous-time/discrete-time, periodic/non-periodic, even/odd,energy/power, deterministic/ random, one-dimensional/multidimensional; commonly used signals (in continuous-time aswell as in discrete-time): unit impulse, unit step, unit ramp (andtheir interrelationships), exponential, rectangular pulse,sinusoidal; operations on continuous-time and discrete-timesignals (including transformations of independent variables).

**UNIT-2**
**Laplace-Transform (LT) and Z-transform (ZT):**
(i) One-sided LT of some common signals, important theoremsand properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence(ROC)
(ii) One sided and Bilateral Z-transforms, ZT of some commonsignals, ROC, Properties and theorems, solution of differenceequations using one-sided ZT, s- to z-plane mapping

**UNIT-3**
**Fourier Transforms (FT):**
(i) Definition, conditions of existence of FT, properties,magnitude and phase spectra, Some important FT theorems,Parseval's theorem, Inverse FT, relation between LT and FT
(ii) Discrete time Fourier transform (DTFT), inverse DTFT,convergence, properties and theorems, Comparison betweencontinuous time FT and DTFT

**UNIT-4**
**Systems**: Classification, linearity, time-invariance and causality,impulse response, characterization of linear time-invariant (LTI)systems, unit sample response, convolution summation, stepresponse of discrete time systems, stability.
Convolution integral, co-relations, signal energy and energyspectral density, signal power and power spectral density,properties of power spectral density,

**UNIT-5**
**Time and frequency domain analysis of systems**
Analysis of first order and second order systems, continuous-time(CT) system analysis using LT, system functions of CT systems,poles and zeros, block diagram representations; discrete-timesystem functions, block diagram representation, illustration of theconcepts of system bandwidth and rise time through the analysisof a first order CT low pass filter

**Text Book:** P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

**Reference Books:**
Chi-Tsong Chen, `Signals and Systems', 3rd Ed., Oxford University Press, 2004
    V. Oppenheim, A.S. Willsky& S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2003.

# [BTEC-34]Switching Theory & Logic Design

**UNIT-1**

Digital system and binary numbers: Signed binary numbers,binary codes.Gate-level minimization: The map method up to four variable,don't care conditions, POS simplification, NAND and NORimplementation, Quine Mc-Clusky method (Tabular method).

**UNIT-2**

Combinational Logic: Combinational circuits, analysisprocedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders,encoders, multiplexers

**UNIT-3**

Synchronous Sequential logic: Sequential circuits, storageelements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flowtable, race free state assignment, hazards.

**UNIT-4**

Registers and counters: Shift registers, ripple counter,synchronous Counter, other counters.Memory and programmable logic: RAM, ROM, PLA, PAL.

**Text Book:** M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education
**Reference Books:**
1. Hill & Peterson, "Switching Circuit & Logic Design", Wiley.
2. Mohammad A. Karim and Xinghao Chen, "Digital Design-Basic concepts and
Principles", CRC Press Taylor & Francis group, 2010.

# [BTIP-31]  Industrial Psychology

**Unit-I**

Introduction to Industrial Psychology – Definitions & Scope. Major influences on industrial Psychology- Scientific management and human relations schools Hawthorne Experiments

**Unit-II**

Individual in Workplace Motivation and Job satisfaction , stress management. Organizational culture, Leadership & group dynamics.

**Unit-III**

Work Environment & Engineering Psychology-fatigue. Boredom, accidents and safety.Job Analysis, Recruitment and Selection – Reliability & Validity of recruitment tests.

**Unit –IV**

Performance Management : Training & Development.

**References :**

 1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.

2. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.

3. Aamodt, M.G. (2007) Industrial/Organizational Psychology : An Applied Approach (5th edition) Wadsworth/Thompson : Belmont, C.A

. 4. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi : Tata McGraw Hill

# [BTAC-31]  Human Value & Professional Ethics

Module-1

Course introduction, Needs Basic guidelines

1 Understand the need , basic , guidelines content for process value education.
2. Self Exploration what is it? It content and process, Natural Acceptence and experiential Validation as the mechanism for self exploration.
3 Continues happiness and Prosperty- A look at continues human Aspiration.
4 Understanding Happiness and Prosperty correctly- A critical appraisal of the current senerio.
5 Method to fulfilled the human aspiration

Module -2
 Understanding Harmony in human Being ( Harmony in Myself )
1.  Understanding Harmony as a co – existence of the sentient I and the Material Body.
2.  Understanding the need of self ( I ) and body sukh and suvidha.
3.  Understanding the body of an instrument of I ( being Doar, seer and enjoyer.
4.  Understanding the Charactersticks and activities of (I)

Module -3

Understanding harmony in the Family and Society

1.   Understanding harmony in the Family and basic unit of  Human interaction.
2.  Understanding values in human – Human relationship meaning of nayaya and program for the fulfillment of ensure abhay and tripti.
3.  Understanding the meaning of Vishvas difference between intension and competence.
4.  Understanding the Harmony in the society ( society being an Extension of family  - samadhan , Samriddi , Abhay,sahastitva and comprehension of Human goals.


Module -4

   Understanding the harmony in the Nature and existence – whole Existence  as Co- existence.

1   Understanding the harmony in the Nature.
2   Interconnectedness and mutual fulfillment among the four order of Nature –recyclability ,andself  regulation in nature.
3   Holistic prception of Harmony at all levels of existence.

Module – 5 Implication of the above Holistic understanding of Harmony on professional ethics.

1   Natural acceptance of human values.
2   Deffinativeness of ethical human conduct.
3   Basic for humanistic education. Humanstick constitution and human universal order.
4   Case studies of typical holistic technologies , Management model and Production system.
5   Strategy for transition from the presnt stage of universal order.
    A - At the level of individual : as socialy and ecologically responsible engineers technologist and manager.
    B- At the Level of Society as mutually enriching institution and organisations

# [BTEC-31P ]NETWORK ANALYSIS & SYNTHESIS LAB

1. Study and verification of network theorems with input signal of 1 kHz, 10kHz and 100kHz.

2. Verification of two port network parameters

3. Step and Ramp response of series and parallel RC circuits

4. Verification of properties of RC circuits

5. Verification of properties of RL circuits

6. Verification of properties of LC circuits

7. Verification of inverting, non-inverting and voltage follower VCVS circuits using 741 op-amp

8. Verification of inverting integrator using 741 op-amp

9. Design a finite gain differential amplifier with infinite input impedance and verify the output response.

# [BTEC-35P]ELECTRONIC WORKSHOP & PCB LAB

1. Study of CRO, DMM & Function Generator

2. Identification of Active & Passive Components

3. Winding shop: Step down transformer winding of less than 5VA.

4. Soldering shop: Fabrication of DC regulated power supply

5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.

6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

7. Testing of regulated power supply fabricated.

# [BTEC-34P ] LOGIC DESIGN LAB

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/De-multiplexer and Encoder using logic gates.

5. Implementation of 4x1 multiplexer using logic gates.

6. Implementation of 4-bit parallel adder using 7483 IC.

7. Design, and verify the 4-bit synchronous counter.

8. Design, and verify the 4-bit asynchronous counter.

9. Mini Project (Imp)

# [BTEC-32P] ELECTRONIC DEVICES LAB

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active,Passive

Components & Bread Board.

2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurementfrom graph.

3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripplefactor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper

4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics.Graphical measurement of forward and reverse resistance.

5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation byvarying load resistor.

6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters frominput and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential dividerbiasing.

7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parametersgm, rd& m from input and output characteristics.

8. **Characteristic** of silicon-controlled rectifier.

9. **To plot** V-I Characteristics of DIAC.

10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

# [BTCS-45]  Data Structure

**UNIT-I**
Introduction: Basic Terminology, Elementary Data Organization, Algorithm,Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations:Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row MajorOrder, and Column Major Order, Application of arrays, Sparse Matrices andtheir representations. Linked lists: Array Implementation and DynamicImplementation of Singly Linked Lists, Doubly Linked List, Circularly LinkedList, Operations on a Linked List. Insertion, Deletion, Traversal, PolynomialRepresentation and Addition, Generalized Linked List

**UNIT--II**
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array andLinked Implementation of Stack in C, Application of stack: Prefix and PostfixExpressions, Evaluation of postfix expression, Recursion, Tower of HanoiProblem, Simulating Recursion, Principles of recursion, Tail recursion,Removal of recursionQueues, Operations on Queue: Create, Add, Delete, Full and Empty, Circularqueues, Array and linked implementation of queues in C, Dequeue and PriorityQueue.

**UNIT-III**
Trees: Basic terminology, Binary Trees, Binary Tree Representation: ArrayRepresentation and Dynamic Representation, Complete Binary Tree, AlgebraicExpressions, Extended Binary Trees, Array and Linked Representation ofBinary trees, Tree Traversal algorithms: In order, Preorder and Post order,Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

**UNIT-IV**
 Graphs: Terminology, Sequential and linked Representations of Graphs:Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal :Depth First Search and Breadth First Search, Connected Component, Spanning

Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm.Transistive Closure and Shortest Path algorithm: Warshal Algorithm andDijikstra Algorithm, Introduction to Activity Networks

**UNIT-V**
Searching : Sequential search, Binary Search, Comparison and AnalysisInternal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two WayMerge Sort, Heap Sort, Radix Sort

**Text book:**
1. Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein "Data Structures Using Cand C++" , PHI
**References**
1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication
2. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications",McGraw Hill
3. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
4. Lipschutz, "Data Structures" Schaum's Outline Series, TMH
5. G A V Pai, "Data Structures and Algorithms", TMH

# [BTEC-41]  Electronic Circuits

**UNIT-I**
**Operational Amplifier:** Inverting and non-inverting configurations,difference amplifier, Effect of finite open loop gain and bandwidth oncircuit performance, Large signal operation of op-amp.

**UNIT-II**
**MOSFET:** Review of device structure operation and V-I characteristics.Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOSamplifier circuits, small-signal operation and models, single stage MOSamplifier, MOSFET internal capacitances and high frequency model,frequency response of CS amplifier

**UNIT-III**
**BJT:** Review of device structure operation and V-I characteristics, BJTcircuits at DC, BJT as amplifier and switch, biasing in BJT amplifiercircuit, small-signal operation and models, single stage BJT amplifier,BJT internal capacitances and high frequency model, frequency responseof CE amplifier.

**UNIT-IV**
**Differential Amplifier:** MOS differential pair, small signal operation ofthe MOS differential pair, BJT differential pair, other non-idealcharacteristic of the Differential amplifier (DA), DA with active load.

**UNIT-V**
**Feedback:** The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedbackamplifier, the series-series feedback amplifier, the shunt-shunt and shuntseriesfeedback amplifier.
**Oscillators:** Basic principles of sinusoidal oscillators, op-amp RCoscillator circuits, LC oscillator.
**Text Book**: A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.
**Reference Books:** Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Ed TMH

# [BTEC-42]  Electronic Measurements & Instrumentation

**UNIT-I**
Unit, dimensions and standards: Scientific notations and metric prefixes.SI electrical units, SI temperature scales, Other unit systems, dimensionand standards.Measurement Errors: Gross error, systematic error, absolute error andrelative error, accuracy, precision, resolution and significant figures,Measurement error combination, basics of statistical analysis.PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohmmeter.

**UNIT-II**
Transistor voltmeter circuits, AC electronic voltmeter, currentmeasurement with electronic instruments, probesDigital voltmeter systems, digital multimeters, digital frequency metersystem.

**UNIT-III**
Voltmeter and ammeter methods, Wheatstone bridge, low resistancemeasurements, low resistance measuring instrumentsAC 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, Oscilloscopeprobes, Oscilloscope specifications and performance.Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSOapplications

**UNIT-V**
Instrument calibration: Comparison method, digital multimeters asstandard instrument, calibration instrumentRecorders: X-Y recorders, plotters

**Text Book:** David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008.
**Reference Books:**
Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (ButerworthHeinmann), 2008**.**


# [BTEC-43]   Electromagnetic Field Theory

**UNIT-I**
Coordinate systems and transformation: Cartesian coordinates, circularcylindrical coordinates, spherical coordinates
Vector calculus: Differential length, area and volume, line surface andvolume integrals, del operator, gradient of a scalar, divergence of avector and divergence theorem, curl of a vector and Stoke's theorem,Laplacian of a scalar.

**UNIT-II**
Electrostatics: Electrostatic fields, Coulombs law and field intensity,Electric field due to charge distribution, Electric flux density, Gausses'sLaw – Maxwell's equation, Electric dipole and flux lines, energy densityin electrostatic fields.
Electric field in material space: Properties of materials, convection andconduction currents, conductors, polarization in dielectrics, dielectricconstants, continuity equation and relaxation time, boundary condition.Electrostatic boundary value problems: Poission's and Laplace'sequations, general procedures for soling Poission's or Laplace'sequations, resistance and capacitance, method of images.

**UNIT-III**
Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere'scircuit law, Maxwell's equation, application of ampere's law, magneticflux density- Maxwell's equation, Maxwell's equation for static fields,magnetic scalar and vector

potential.Magnetic forces, materials and devices: Forces due to magnetic field,magnetic torque and moment, a magnetic dipole, magnetization inmaterials, magnetic boundary conditions, inductors and inductances,magnetic energy.

## UNIT-IV

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 lossy 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.

**Text Book:** M. N. O. Sadiku, "Elements of Electromagnetics", 4th , Ed, Oxford University Press.
**Reference Books:** W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH.
Pramanik-Electromagnetism: Vol.1-Theory, PHI Learning Pvt. Ltd

# [BTIS-41]  Industrial Sociology

# [BTAC-31]  Cyber Security

## UNIT-1

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

## UNIT-2

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats - Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, eCash,Credit/Debit Cards. Digital Signature, public KeyCryptography.

## UNIT-3

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control,CCTV and intrusion Detection Systems, Backup Security Measures.

## UNIT-4

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, PolicyReview Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement ofthe Policies.Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; ITAct 2000 Provisions,Intellectual Property Law: Copy Right Law, Software License, Semiconductor Lawand Patent Law.

## References :

1. Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security ", Pearson Education India.

2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.

3.Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen kumar Shukla ,"Introduction to Information Security and

Cyber Law" Willey Dreamtech Press.

# SCIENCE BASED OPEN ELECTIVES
# [BTOE-41]  INTRODUCTION TO SOFT COMPUTING
## (Neural Networks, Fuzzy Logic and Genetic Algorithm)

**Unit-I : Neural Networks-1(Introduction & Architecture)**
Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions,Neural network architecture: single layer and multilayer 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, multilayer perception model; back opogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation 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&Defuzzificataions, 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. VijayalakshmiPai, "Neural Networks,Fuzzy Logic and Genetic
Algorithm:Synthesis and Applications" Prentice Hall of India.
2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.
**Reference Books:**
3. SimanHaykin,"Neural Netowrks"Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.

# [BTOE-42]  NANO SCIENCES
**UNIT -1 :**
**Introduction**:
Difinition of Nano-Science and Nano Technology, Applications of Nano-Technology.
**Introduction to Physics of Solid State:**
**Structure:** Size dependence of properties; crystal structures, face centered cubicnanoparticles; Tetrehedrally bounded semiconductor structures; lattice vibrations.
**Energy Bands:** Insulators, semiconductor and conductors; Reciprocal space; Energybands and gaps of semiconductors; effective masses; Fermi Surfaces.
**Localized Particles:** Acceptors and deep taps; mobility; Excitons.

**UNIT-2**

**Quantum Theory For Nano Science:**
Time dependent and time independent Schrodinger wave equations.Particle in a box, Potential step: Refelection and tunneling(Quantum leak). Penetration ofBarrier, Potential box(Trapped particle in 3D:Nanodot), Electron trapped in 2D plane(Nanosheet), Quantum confinerment effect in nano materials.

**Quantum Wells, Wires and Dots**
Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermigas;Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infraredetectors; Quantum dot laser Superconductivity.

**Properties of Individual Nano particles**
**Metal Nano clusters:** Magic Numbers; Theoretical Modelling of Nanopraticles;geometric structure; electronic structure; Reactivity; Fluctuations Magnetic Clusters;Bulle to Nano structure.

**Semi conducting Nanoparticles:** Optical Properties; Photofragmentation; Coulmbicexplosion.

**Rare Gas & Molecular Clusters:** Inert gas clusters; Superfluid clusters molecularclusters.

**UNIT-3**
**Growth Techniques of Nanomaterials**:
Lithograpahic and Nonlithograpahic techniques, Sputtering and film deposition in glowdischarge, DC sputtering technique(p-CuAlO$_2$ deposition). Thermal evaporationtechnique, E-beam evaporation, Chemical Vapour deposition(CVD), Synthesis of carbonnano-fibres and multi-walled carbon nanotubes, Pulsed Laser Deposition, Molecularbeam Epitoxy, Sol-Gel Techniuqe (No chemistry required), Synthesis of nanowires/rods,Electrodeposition, Chemical bath deposition, Ion beam deposition system, Vapor-Liquid–Solid (VLS) method of nanowires.

**UNIT -4**
**Methods of Measuring Properties:**
**Structure:** Crystallography, particle size determination, surface structure,
**Microscopy:** Scanning Prob Microscopy (SPM), Atomic Force Microscopy (AFM),Field Ion Microscopy, Scanning Electron Microscopy, Transmission ElecrtronMicroscopy (TEM)
**Spectroscopy:** Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magneticresonance, Optical and Vibrational Spectroscopy, Luninscence.

**UNIT-5**
**Buckey Ball:**
Nano structuresofcarbon(fullerene):
**Carbon nano-tubes:** Fabrication , structure. electrical, mechanical, and vibrationalproperties and applications.Nano diamond, Boron Nitride Nano-tubes, single elecron transistors, Moelcularmachine, Nano-Biometrics, Nano Robots.

**Text/Reference Books:**
1. C.P.Poole Jr F.J. Owens, "Introduction to Nanotechnology".
2. "Introduction to S.S. Physics" - (7th Edn.) Wiley 1996.

# [BTOE-43]  LASER SYSTEMS AND APPLICATIONS

**UNIT-I & II**
**Introduction:**
Review of elementary quantum physics, Schrodinger equation, concept of coherence,absorption, spontaneous emission and stimulated emission processes, relation betweenEinstein's A and B coefficients, population inversion, pumping, gain, optical cavities.

**UNIT-III & IV**
**Lasers & Laser Systems:**
Main components of Laser, principle of Laser action, introduction to general lasers andtheir types. Three & four level Lasers, CW & Pulsed Lasers, atomic, ionic, molecular,excimer, liquid and solid state Lasers and systems, short pulse generation andMeasurement.

**UNIT-V**
**Applications:**

Laser applications in medicine and surgery, materials processing, opticalcommunication, metrology and LIDAR and holography.

**Text/ Reference Books:**
1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International.
2. S. A. Ahmad, "Laser concepts and Applications" New Age Internati

# [BTOE-44] SPACE SCIENCES

**1. Introduction:**
Introduction to space science and applications, historical development
**2. Solar System:**
Nebular theory of formation of our Solar System.Solar wind and nuclear reaction as the source of energy.
**Sun and Planets:** Brief description about shape size, period of rotation about axis andperiod of revolution, distance of planets from sun, Bode's law, Kepler's Laws ofplanetary motion, Newton's deductions from Kepler's Laws, Newton's Law ofgravitation, 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.
**3. Stars:**
Stellar spectra and structure, stellar evolution, nucleo-synthesis and formation ofelements.
**Classification of stars:** Harvard classification system, Hertzsprung-Russel diagram,
Luminosity of star, variable stars; composite stars (white dwarfs, Neutron stars, blackhole, star clusters, supernova and binary stars); Chandrasekhar limit.
**4. Galaxies:**
Galaxies and their evolution and origin, active galaxies and quasars.
**5. Creation of Universe:**
Early history of the universe, Big-Bang and Hubble expansion model of the universe,cosmic microwave background radiation, dark matter and dark energy.
**Text Books / Reference Books:**
1. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International.
2. K. S. Krishnaswami, "Understanding cosmic Panorama" New Age International.

# [BTOE-45] POLYMER SCIENCE AND TECHNOLOGY

**UNIT –I & II**
**POLYMERS:**
Introduction, chemistry of polymer synthesis, polymer reaction kinetics, physical properties andcharacterization of polymers, effect of structure on properties of polymers, organic polymers.Introduction to high performance polymers and composites and their processing.
**UNIT –III & IV**
**POLYMERIZATION:**
Introduction, step-growth polymerization, free radical chain growth polymerization, emulsionpolymerization, ionic and cationic polymerization, chain statistics and rubber elasticity.
**UNIT – UNIT –V & VI**
**PREPARATION AND APPLICATIONS:**
Preparation, properties and technical applications of thermo-plastics (PVC, PVA), thermostats(PF, UF) and elastomers (SBR, GR-N), silicones.Application of polymers in space, ocean,electronics, medical, agriculture, automobile, sports and building construction.

# [BTOE-46] NUCLEAR SCIENCE

**UNIT-I**
**Nucleus and Its Basic Features:**

Nuclear structure; nuclear forces and their properties, nuclear stability, nuclear radius and itsmeassurement, nuclear spin, nuclear magnetic and electrical moments.

**UNIT-II**
**Nuclear Models:**
Single particle model, liquid drop model and semi-emperical mass formula, nuclear potentialand shell model, collective model.

**UNIT-III**
**Nuclear Reaction:**
Nuclear reaction and laws of conservation, types of nuclear reaction, mechanism of nuclearreaction, nuclear fission & binuclear fusion and their explanation by liquid drop model.

**UNIT-IV**
**Nuclear Decay:**
Decay constant, half life period and mean life, alpha decay, beta decay, gamma decay,interaction of nuclear radiation with matter.

**Nuclear Instruments-I**
Mass spectrograph,: General principle, Aston's Mass Spectrograph.

**UNIT-V**
**Nuclear Instruments-II**
**Accelerators:** Van de Graph Generator, Cyclotron, Synchrotron.
**Detectors:** G M Counter, Scintillation counter, cloud chamber, Bubble Chamber, production anddetection of neutrons and Gamma-photon.
**Application of Nuclear Techniques**: Nuclear magnetic resonance, positron emissiontopography, radiotracer techniques and applications in material science and agriculture.

**Text Books:**
1. Tayal, "Nuclear Physics" Himalaya Publishing House.
2. S.N. Ghosal, "Nuclear Physics" S. Chand & Co.

**Reference Books:**
6. Roy & Nigam, "Nuclear Physics" John Wiley & sons.
7. W.E. Burcham, "Nuclear Physics" Longmans Publications.

# [BTOE-47]   MATERIAL SCIENCE

**UNIT-I**
**Introduction:** Historical perspective, importance of materials, Brief review of modern & atomicconcepts 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 packingfactor 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, stressVs 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 andmicrostructure exam and grain size determination, comparative study of microstructure ofvarious metals and alloys, such as Mild steel, CI, Brass.

**Phase Diagram and Equilibrium Diagram:** Uniary and Binary diagrams, Phase rules, Types ofequilibrium diagrams: solid solution type, eutectic type and combination type, Iron-carbonequilibrium diagram.

**UNIT-III**
**Ferrous materials:** Iron and steel manufacture, furnaces, various types of carbon steels, alloysteels 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 itsapplications. 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. Intrinsicand 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. HighTemp. superconductors.

## UNIT-V

**Ceramics:** Structure, types, properties and applications of ceramics. Mechanical/Electricalbehaviour and processing of ceramics.

**Plastics:** Various types of polymers/plastics and their applications. Mechanical behaviour andprocessing of plastics, Future of plastics.

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

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

**Performance of materials in service:** Brief theoretical consideration of fracture, fatigue, andcorrosion 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

# [BTOE-48]   DISCRETE MATHEMATICS

## UNIT-I

**Set Theory**: Definition of Sets, Venn Diagrams, complements, cartesian products, powersets, counting principle, cardinality and countability (Countable and Uncountable sets),proofs of some general identitites on sets, pigeonhole principle.

**Relation:**Definition, types of relation, composition of relations, domain and range of arelation, pictorial representation of relation, properties of relation, partial ordering relation.

**Function:** Definition and types of function, composition of functions, recursively definedfunctions.

## UNIT-II

**Propositional logic:** Proposition logic, basic logic, logical connectives, truth tables,tautologies, contradiction , normal forms(conjunctive and disjunctive), modus ponens andmodus tollens, validity, predicate logic, universal and existential quantification.

**Notion of proof:** proof by implication, converse, inverse, contrapositive, negation, andcontradiction, direct proof, proof by using truth table, proof by counter example.

## UNIT-III

**Combinatories:**Mathematical induction, recursive mathematical definitions, basics ofcounting, permutations, combinations, inclusion-exclusion, recurrence relations ($n_{th}$ orderrecurrence relation with constant coefficients, Homogeneous recurrence relations,Inhomogeneous recurrence relation), generating function (closed form expression, propertiesof G.F., solution of recurrence relation using G.F, solution of combinatorial problem usingG.F.)

## Unit-IV

**Algebraic Structure:**Binary composition and its properties definition of algebraic structure;Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, PermutationGroups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

## 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, treetraversing (preorder, inorder, postorder).

**Finite Automata:** Basic concepts of Automation theory, Deterministic finiteAutomation(DFA), transition function, transition table, Non Deterministic Finite Automata(NDFA), Mealy and Moore Machine, Minimization of finite Automation.

**Text/Reference Books:**
1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.
2. V. Krishnamurthy, "Combinatories:Theory and Applications", East-West Press.

# [BTOE-49]  APPLIED LINEAR ALGEBRA

**UNIT-1**
Fields, Vector-spaces, sub-spaces, linear-combination, linear-dependence and independence.Basis, dimensions and coordinates (each and every fact to be illustrated by suitable examples).

**UNIT-2**
Linear-transformation, definition and examples, matrix representation, similarity, range andkernel, rank-nullity theorem and its consequences.

**UNIT-3**
Singular and non singular linear transformations, sum and product of linear transformations,vector space of linear transformations, nilpotent linear transformations.

**UNIT-4**
Inner product spaces, definition and examples, orthogonality, Cauchy-Schwartz Inquality,Minkowski Inequality, polarization Identity, complete ortho normal set, Bessel's Inequality,Gram-Schmidt's orthogonalization process.

**UNIT-5**
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 andeigen vectors, diagonalisation of linear operators, quadratic forms, principle axistheorem(without proof), some applications to engineering problems.

**TEXT/REFERENCE BOOKS**
1. Dym, H. Linear Algebra in action, University Press.2012
2. Halmos, P.R.: Finite Dimensional Vector Spaces (1990) Narosa.