GROUP-A
1ST SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHYS1-101	Physics (Semiconductor Physics)	3	1	0	40	60	100	4
BMATH1-101	Mathematics-I (Calculus, Linear Algebra)	3	1	0	40	60	100	4
BMECE0-101	Engineering Graphics & Design	2	0	0	40	60	100	2
BELEE0-101	Basics Electrical Engineering	3	1	0	40	60	100	4
BPHYS1-102	Physics (Semiconductor Physics) Lab.	0	0	2	60	40	100	1
BMECE0-102	Engineering Graphics & Design Lab.	0	0	6	60	40	100	3
BELEE0-102	Basics Electrical Engineering Lab.	0	0	2	60	40	100	1
BHUMA0-104	Drug Abuse: Problem, Management and Prevention	3	0	0	100	0	100	0
BCOBE0-101	Introduction to Concerned Branch of Engineering	2	0	0	100	0	100	0
Total		13	3	8	440	360	800	19

Note:

1. There will be Induction Programme of 3 weeks before start of normal classes.
2. Drug Abuse: Problem, Management and Prevention and Introduction to Concerned Branch of Engineering are non-credit Courses; however, it is necessary to secure at least E grade in each of them.

2ND SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BCHEM0-101	Chemistry-I	3	1	0	40	60	100	4
BMATH1-201	Mathematics-II (Probability and Statistics)	3	1	0	40	60	100	4
BHUMA0-101	English	2	0	0	40	60	100	2
BCSCE0-101	Programming for Problem Solving	3	0	0	40	60	100	3
BCHEM0-102	Chemistry-I Lab.	0	0	2	60	40	100	1
BHUMA0-102	English Lab.	0	0	2	60	40	100	1
BCSCE0-102	Programming for Problem Solving Lab.	0	0	4	60	40	100	2
BMFPR0-101	Manufacturing Practices	1	0	4	60	40	100	3
BHUMA0-103	Human Values & Professional Ethics	3	0	0	100	0	100	0
Total		15	2	12	500	400	900	20

Note:

1. Human Values & Professional Ethics is a non-credit Course; however, it is necessary to secure at least E grade in it.
2. Marks of 4 Week Manufacturing Practices Training during Summer Vacation will be included in 3rd Semester

GROUP-B
1ST SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BCHEM0-101	Chemistry-I	3	1	0	40	60	100	4
BMATH1-101	Mathematics-I (Calculus, Linear Algebra)	3	1	0	40	60	100	4
BHUMA0-101	English	2	0	0	40	60	100	2
BCSCE0-101	Programming for Problem Solving	3	0	0	40	60	100	3
BCHEM0-102	Chemistry-I Lab.	0	0	2	60	40	100	1
BHUMA0-102	English Lab.	0	0	2	60	40	100	1
BCSCE0-102	Programming for Problem Solving Lab.	0	0	4	60	40	100	2
BMFPR0-101	Manufacturing Practices	1	0	4	60	40	100	3
BHUMA0-103	Human Values & Professional Ethics	3	0	0	100	0	100	0
BCOBE0-101	Introduction to Concerned Branch of Engineering	2	0	0	100	0	100	0
Total		15	2	12	500	400	900	20

Note:

1. **There will be Induction Programme of 3 weeks before start of normal classes.**
2. **Human Values & Professional Ethics and Introduction to Concerned Branch of Engineering are non-credit Courses; however, it is necessary to secure at least E grade in each of them.**

2ND SEMESTER

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHYS1-101	Physics (Semiconductor Physics)	3	1	0	40	60	100	4
BMATH1-201	Mathematics-II (Probability and Statistics)	3	1	0	40	60	100	4
BMECE0-101	Engineering Graphics & Design	2	0	0	40	60	100	2
BELEE0-101	Basics Electrical Engineering	3	1	0	40	60	100	4
BPHYS1-102	Physics (Semiconductor Physics) Lab.	0	0	2	60	40	100	1
BMECE0-102	Engineering Graphics & Design Lab.	0	0	6	60	40	100	3
BELEE0-102	Basics Electrical Engineering Lab.	0	0	2	60	40	100	1
BHUMA0-104	Drug Abuse: Problem, Management and Prevention	3	0	0	100	0	100	0
Total		13	3	8	440	360	800	19

Note:

1. **Drug Abuse: Problem, Management and Prevention is a non-credit Course; however, it is necessary to secure at least E grade in it.**
2. **Marks of 4 Week Manufacturing Practices Training during Summer Vacation will be included in 3rd Semester**

PHYSICS (SEMICONDUCTOR PHYSICS)

Subject Code: BPHYS1-101 **L T P C** **Duration: 38 Hrs.**
3 1 0 4

UNIT-I

Quantum Theory: (10 Hrs.)
Need and origin of Quantum Concept, Wave-particle duality, Matter waves, Group and Phase velocities, Concept of Uncertainty Principle and its application: nonexistence of electron in the nucleus, wave function & its significance, normalization of wave function, Schrodinger wave equation: time independent and dependent, Eigen functions & Eigen values, particle in a box in 1-D. Concept of scattering from a potential barrier and tunneling.

UNIT-II

Electronic Materials: (8 Hrs.)
Free electron theory, Density of states and energy band diagrams, Introduction to band gap theory, Direct and indirect band gaps. Types of electronic materials: metals, semiconductors and insulators, Occupation probability, Fermi level, Effective mass, phonons.

UNIT-III

Semiconductors and Light- Semiconductor Interactions: (12 Hrs.)
Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices. Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Lasers: principles and working of laser: population inversion, pumping, types of lasers with emphasis on the semi-conductor Lasers.

UNIT-IV

Fibre Optics Communication: (8 Hrs.)
Introduction and importance of use of optical fibres in data transmission, optical fibre as a dielectric wave guide: total internal reflection, numerical aperture and various fibre parameters, losses associated with optical fibres, step and graded index fibres, applications of optical fibres.

Recommended Books:

1. Satayaparkash, 'Quantum Mechanics'.
2. A. Ghatak and Lokanathan, 'Quantum Mechanics'.
3. J. Singh, 'Semiconductor Optoelectronics: Physics and Technology', McGraw Hill Inc., **1995.**
4. S.M. Sze, 'Semiconductor Devices: Physics and Technology', Wiley, **2008**.
5. A. Yariv and P. Yeh, 'Photonics: Optical Electronics in Modern Communications', Oxford University Press, New York, **2007**.
6. P. Bhattacharya, 'Semiconductor Optoelectronic Devices', Prentice Hall of India, **1997**.
7. M R Shenoy, 'Online Course: Semiconductor Optoelectronics', NPTEL.
8. Monica Katiyar and Deepak Gupta, 'Online Course: Optoelectronic Materials and Devices', NPTEL.
9. Ben. G. Streetman, 'Solid State Electronics Devices', Pearson Prentice Hall.

MATHEMATICS-I (CALCULUS, LINEAR ALGEBRA)

Subject Code: BMATH1-101 **L T P C** **Duration: 46 Hrs.**
3 1 0 4

UNIT –I

Calculus: (12 Hrs.)
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L' Hospital's rule; Maxima and minima. Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT –II

Sequences and Series: (10 Hrs.)
Convergence of sequence and series, tests for convergence (Comparison test, Ratio test, Raabe's test, Logarithmic test, Cauchy's root test, Cauchy's Integral test, series of positive and negative terms); Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.

UNIT –III

Multivariable Calculus: (12 Hrs.)
Limit, continuity and partial derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence: Geometrical interpretation and basic properties, Directional derivative.

UNIT –IV

Linear Algebra: (12 Hrs.)
Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Recommended Books:

1. G.B. Thomas and R.L. Finney, 'Calculus and Analytic Geometry', 9th Edn., Pearson, Reprint, **2002**.
2. Erwin Kreyszig, 'Advanced Engineering Mathematics', 9th Edn, John Wiley & Sons, **2006**.
3. T. Veerarajan, 'Engineering Mathematics for First Year', Tata McGraw Hill, New Delhi, **2008.**
4. B.V. Ramana, 'Higher Engineering Mathematics', 11th Reprint, Tata McGraw Hill, New Delhi, **2010**.
5. D. Poole, 'Linear Algebra: A Modern Introduction', 2nd Edn., Brooks/Cole, **2005**.
6. B.S. Grewal, 'Higher Engineering Mathematics', 36th Edn., Khanna Publishers, **2010**.

Course Outcomes:
The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.
The students will learn:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
3. The tool of power series and Fourier series for learning advanced Engineering Mathematics.

4. To deal with functions of several variables that are essential in most branches of engineering.
5. The essential tool of matrices and linear algebra in a comprehensive manner.

ENGINEERING GRAPHICS & DESIGN

Subject Code: BMECE0-101 **L T P C** **Duration: 24 Hrs.**
2 0 0 2

1. **Traditional Engineering Graphics:**
   Principles of Engineering Graphics; Scales; Orthographic Projection- Points, lines, planes and solids; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle, Shortest Distance.
2. **Computer Graphics:**
   Co-ordinate system; Types of CAD software, draw commands; Modify commands; Dimensioning; setting of units & limits; Editing of Drawing; Printing.

Recommended Text/Reference Books:

1. N.D. Bhatt, V.M. Panchal & P.R. Ingle, 'Engineering Drawing', Charotar Publishing House, **2014**.
2. M.B. Shah & B.C. Rana, 'Engineering Drawing and Computer Graphics', Pearson Education, **2008**.
3. B. Agrawal & C.M. Agrawal, 'Engineering Graphics', TMH Publication, **2012**.
4. K.L. Narayana & P. Kannaiah, 'Text book on Engineering Drawing', Scitech Publishers, **2008**.
5. (Corresponding set of) CAD Software Theory and User Manuals.

Course Outcomes:

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

1. To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. To prepare you to communicate effectively.
3. To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The student will learn:

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modelling
5. Exposure to computer-aided geometric design
6. Exposure to creating working drawings
7. Exposure to engineering communication

BASIC ELECTRICAL ENGINEERING

Subject Code: BELEE0-101 **L T P C** **Duration: 42 Hrs.**
3 1 0 4

UNIT-1

DC Circuits: (8 Hrs.)
Electrical circuit elements (R, L and C), voltage and current sources, Ohm's law, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation Superposition, Thevenin and Norton Theorems. Step response of RL, RC circuits.

UNIT-2

AC Circuits: (12 Hrs.)
Representation of sinusoidal waveforms, average, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC series and parallel combinations, series and parallel resonance. Three phase voltage source, phase sequence, three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-3

Transformers: (10 Hrs.)
Magnetic materials, BH characteristics, Single-phase Transformer, no load and full load conditions, phasor diagrams, equivalent circuit, calculation of losses in transformers, regulation and efficiency, Auto-transformers, their applications and comparison with two winding transformers.

UNIT-4

Electrical Machines: (8 Hrs.)
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Direct-On-Line and Star-Delta starters**.** Construction and working of single-phase motors (Split phase, shaded pole, capacitor start, capacitor run, capacitor start and run motors).

Electrical Installations: (4 Hrs.)
Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB), Moulded Case Circuit Breaker (MCCB), Types of Wiring, Earthing.

Recommended Books:

1. D.P. Kothari and I.J. Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill, **2010**.
2. D.C. Kulshreshtha, 'Basic Electrical Engineering', McGraw Hill, **2009**.
3. L.S. Bobrow, 'Fundamentals of Electrical Engineering', Oxford University Press, **2011**.
4. E. Hughes, 'Electrical and Electronics Technology', Pearson, **2010**.
5. V.D. Toro, 'Electrical Engineering Fundamentals', Prentice Hall, India, **1989**.
6. J.P.S. Dhillon. J.S. Dhillon and D. Singh, 'Principles of Electrical & Electronics Engineering', Kalyani Publishers, New Delhi, **2005**.

Course Outcomes:

1. To understand and analyze basic DC and AC circuits.
2. To study the use and working principle of single phase transformers.
3. To study the application and working principles of three phase and single phase induction motors.
4. To introduce to the components of low voltage electrical installations.

PHYSICS (SEMICONDUCTOR PHYSICS) LAB.

Subject Code: BPHYS1-102 **L T P C**
0 0 2 1

Note: Students will have to perform at least 10 experiments from the given topic/list.

Experiments based on Semiconductor Physics:

1. To study the V-I characteristic of different PN junction diode-Ge and Si.
2. To study the V-I characteristic of Zener diode.
3. To study the V-I characteristic of LED.
4. To analyze the suitability of a given Zener diode as a power regulator.
5. To find out the intensity response of a solar cell/Photo diode.
6. To find out the intensity response of a LED.
7. To determine the band gap of a semiconductor.
8. To determine the resistivity of a semiconductor by four probe method.
9. To confirm the de Broglie equation for electrons.
10. To study voltage regulation and ripple factor for a half-wave and a full-wave rectifier without and with different filters.
11. To study the magnetic field of a circular coil carrying current.
12. To find out polarizability of a dielectric substance.
13. To study B-H curve of a ferromagnetic material using CRO.
14. To find out the frequency of AC mains using electric-vibrator.
15. To find the velocity of ultrasound in liquid.
16. To study the Hall effect for the determination of charge current densities.
17. Distinguish between Diamagnetic material, Paramagnetic and ferromagnetic material.
18. Measurement of susceptibility of a liquid or a solution by Quincke's method:
19. AFM experiment to study the sample with the nano-scale objects and measure surface topography with different scales, width and height of nano objects, and force-distance curves.
20. To study the temperature coefficient of Resistance of copper.

Physics Virtual Lab. Experiments:

21. To plot the characteristics of thermistor and hence find the temperature coefficient of resistance.
22. To determine the resistivity of semiconductors by Four Probe Method.
23. To study the forward and reverse biased characteristics of PNP and NPN transistors.
24. To study the B-H Curve.
25. To study the Hall effect experiment to determine the charge carrier density.
26. To determine the magnetic susceptibilities of paramagnetic liquids by Quincke's Method.
27. To study the phenomena of magnetic hysteresis and calculate the retentivity, coercivity and saturation magnetization of a material using a hysteresis loop tracer.
28. Verification and design of combinational logic using AND, OR, NOT, NAND and XOR gates.

Note: Any other experiment based on the above mentioned topics may be included.

ENGINEERING GRAPHICS & DESIGN LAB.

Subject Code: BMECE0-102 **L T P C** **Duration: 60 Hrs.**
0 0 6 3

1. **Introduction to Engineering Drawing:**
   Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Dimensioning, Scales – Plain, Dimensioning-Types, System, Principles, Dimensions – Size & Location.
2. **Orthographic Projections:**
   Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;
3. **Projections of Regular Solids:**
   Basic definitions of solid, types of solid, truncated and frustum of solid, Solids inclined to both the Planes; Draw simple annotation, dimensioning and scale.
4. **Sections and Sectional Views of Right Angular Solids:**
   Prism, Cylinder, Pyramid, Cone – Section of views & true shape; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Development of paper tray, Funnel and Y piece.
5. **Isometric Projections:**
   Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;
6. **Overview of Computer Graphics:**
   Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];
7. **Customization & CAD Drawing:**
   Consisting of set up of the drawing page and the printer, including scale settings, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;
8. **Annotations, Layering & other Functions:**
   Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques.

Note: Examiner shall test the knowledge of students by conducting viva voce from the drawing sheets and through use of Auto CAD.

BASIC ELECTRICAL ENGINEERING LAB.

Subject Code: BELEE0-102 **L T P C**
0 0 2 1

EXPERIMENTS/DEMONSTRATIONS

1. To study basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. real-life resistors, capacitors and inductors.
2. To verify Ohm's law.
3. To verify Kirchhoff's voltage and current laws.
4. To verify Superposition Theorem.
5. To verify Thevenin Theorem.
6. To obtain the sinusoidal steady state response of R-L circuit – impedance calculation and verification. Observation of phase differences between current and voltage.
7. To obtain the sinusoidal steady state response of R-C circuit – impedance calculation and verification. Observation of phase differences between current and voltage.
8. To study resonance phenomenon in R-L-C series circuits.
9. To perform open circuit and short circuit test on a single phase transformer and calculate the efficiency.
10. Demonstration of cut-out sections of machines: Induction machine (squirrel cage rotor and slip ring arrangement) and single-phase induction machines.
11. To connect, start and reverse the direction of rotation by change of phase-sequence of connections of three phase induction motor.
12. To connect, start and reverse the direction of rotation of single-phase induction motor.
13. To demonstrate working of DOL starter for three-phase induction motor.
14. To demonstrate working of star-delta starter for three-phase induction motor.
15. To demonstrate the components of LT switchgear.

Laboratory Outcomes:

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical induction motors.

DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION

Subject Code: BHUMA0-104 **L T P C** **Duration: 30 Hrs.**
3 0 0 0

UNIT-I

Meaning of Drug Abuse:
Meaning: Drug abuse, Drug dependence and Drug addiction. Nature and extent of drug abuse in India and Punjab.

UNIT-II

Consequences of Drug Abuse:
Individual: Education, Employment, Income.
Family: Violence.
Society: Crime.
Nation: Law and Order problem.

UNIT-III

Prevention of Drug Abuse:

Role of Family: Parent-child relationship, Family support, supervision, shipping values, active scrutiny.

School: Counselling, Teacher as role-model, Parent-teacher-health professional coordination, Random testing on students.

UNIT-IV

Treatment and Control of Drug Abuse:

Medical Management: Medication for treatment and to reduce withdrawal effects.

Psychological Management: Counselling, Behavioural and Cognitive therapy.

Social Management: Family, Group therapy and Environmental intervention.

Treatment: Medical, Psychological and Social Management.

Control: Role of Media and Legislation.

Recommended Books:

1. Ram Ahuja, 'Social Problems in India', Rawat Publications, Jaipur, **2003**.
2. 'Extent, Pattern and Trend of Drug Use in India', Ministry of Social Justice and Empowerment, Govt. of India, **2004.**
3. J.A. Inciardi, 'The Drug Crime Connection', Sage Publications, Beverly Hills, **1981**.
4. T. Kapoor, 'Drug Epidemic among Indian Youth', Mittal Publications, New Delhi, **1985**.
5. Kessel, Neil and Henry Walton, 'Alcoholism, Harmond Worth', Penguin Books, **1982**.
6. Ishwar Modi and Shalini Modi, 'Addiction and Prevention', Rawat Publications, Jaipur, **1997.**
7. 'National Household Survey of Alcohol and Drug Abuse', Clinical Epidemiological Unit, All India Institute of Medical Sciences, New Delhi, **2003 & 2004**.
8. Ross Coomber and Others, 'Key Concept in Drugs and Society', Sage Publications, New Delhi, **2013**.
9. Bhim Sain, 'Drug Addiction Alcoholism, Smoking Obscenity', Mittal Publications, New Delhi, **1991**.
10. Ranvinder Singh Sandhu, 'Drug Addiction in Punjab: A Sociological Study', Guru Nanak Dev University, Amritsar, **2009**.
11. Chandra Paul Singh, 'Alcohol and Dependence among Industrial Workers', Shipra, Delhi, **2000**.
12. S. Sussman and S.L. Ames, 'Drug Abuse: Concepts, Prevention and Cessation', Cambridge University Press, **2008**.
13. P.S. Verma, 'Punjab's Drug Problem: Contours and Characteristics', Vol. LII, No. 3, P.P. 40-43, Economic and Political Weekly, **2017**.
14. 'World Drug Report', United Nations Office of Drug and Crime, **2016**.
15. 'World Drug Report', United Nations Office of Drug and Crime, **2017**.

CHEMISTRY-I

Subject Code: BCHEM0-101 **L T P C** **Duration: 42 Hrs.**

3 1 0 4

Course Objectives:

1. To understand the atomic and & molecular nature of various molecules
2. To understand the band structures
3. To elaborate the applications of spectroscopic techniques
4. To understand the thermodynamic functions and their applications
5. To rationalize periodic properties
6. To understand the concepts of stereochemistry and preparation of organic molecules

UNIT-I

1. Atomic and Molecular Structure: (12 Hrs.)

Bohr Theory of Hydrogen atom, Spectrum of H atom, Sommerfeld extension of Bohr Theory, Particle and wave nature of electron, De-Broglie equation, Aufbau principle, Compton effect, Schrodinger wave equation, Laplacian and Hamiltonian operator, Linear Combination of atomic orbitals. Molecular orbitals of diatomic molecules and Energy level diagrams of homonuclear and heteronuclear diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT-II

2. Spectroscopic Techniques and Applications: (8 Hrs.)

Principles and selection rules of Electronic spectroscopy and Fluorescence spectroscopy along with their applications. Principles and selection rules of Vibrational and rotational spectroscopy of diatomic molecules and their Applications. Nuclear magnetic resonance up to spin-spin coupling and magnetic resonance imaging.

3. Intermolecular Forces and Potential Energy Surfaces: (4 Hrs.)

Ideal gas equation, Ionic, dipolar and van Der Waals interactions. Real gas equation. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, and HCN

UNIT-III

4. Use of Free Energy in Chemical Equilibria: (6 Hrs.)

Ideal Solution, Non Ideal Solutions, Thermodynamic functions: energy, entropy and free energy. Numerical problems based on entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Thermodynamic properties of ideal solutions. Introduction to Electrochemical Corrosion and its mechanism. Use of free energy considerations in metallurgy through Ellingham diagrams.

5. Periodic Properties: (4 Hrs.)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases principle

UNIT-IV

6. Stereochemistry: (4 Hrs.)

Representations of 3-dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis of butane. Isomerism in transitional metal compounds.

7. Organic Reactions and Synthesis of a Drug Molecule: (4 Hrs.)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule – β lactum, Paracetamol, Chloroquine and Aspirin

Recommended Books:

1. B.H. Mahan, 'University Chemistry'.
2. M.J. Sienko and R.A. Plane 'Chemistry: Principles and Applications'.
3. C.N. Banwell, 'Fundamentals of Molecular Spectroscopy'.
4. B.L. Tembe, Kamaluddin and M.S. Krishnan, 'Engineering Chemistry (NPTEL Web-book).
5. P.W. Atkins, 'Physical Chemistry'.
6. K.P.C. Volhardt and N.E. Schore 'Organic Chemistry: Structure and Function', 5th Edn., http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Course Outcomes:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalize bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. List major chemical reactions that are used in the synthesis of molecules.

MATHEMATICS-II (PROBABILITY AND STATISTICS)

Subject Code: BMATH1-201 **L T P C** **Duration: 40 Hrs.**

3 1 0 4

UNIT –I

Basic Probability: (12 Hrs.)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Chebyshev's Inequality.

UNIT –II

Continuous Probability Distributions: (6 Hrs.)

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Bivariate Distributions: (6 Hrs.) Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

UNIT –III

Basic Statistics: (10 Hrs.)

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

UNIT –IV

Applied Statistics: (8 Hrs.)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Small Samples: (4 Hrs.)

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Recommended Books:

1. E. Kreyszig, ‘Advanced Engineering Mathematics’, John Wiley & Sons, **2006**.

2. P.G. Hoel, S.C. Port and C.J. Stone, 'Introduction to Probability Theory', Universal Book Stall, **2003**.
3. S. Ross, 'A First Course in Probability', Pearson Education India, **2002**.
4. W. Feller, 'An Introduction to Probability Theory and its Applications', Vol.-1, Wiley, **1968**.
5. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, **2000**.
6. T. Veerarajan, 'Engineering Mathematics', Tata McGraw Hill, New Delhi, **2010**.

Course Outcomes:

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

1. The mathematical tools needed in evaluating multiple integrals and their usage.
2. The effective mathematical tools for the solutions of differential equations that model physical processes.
3. The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.

ENGLISH

Subject Code: BHUMA0-101 **L T P C** **Duration: 25 Hrs.**

2 0 0 2

UNIT-I

1. Vocabulary Building:

The concept of Word Formation

Root words from foreign languages and their use in English

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.

Synonyms, antonyms, and standard abbreviations.

UNIT-II

2. Basic Writing Skills:

Sentence Structures

Use of phrases and clauses in sentences

Importance of proper punctuation

Creating coherence

Organizing principles of paragraphs in documents

Techniques for writing precisely

UNIT-III

3. Identifying Common Errors in Writing:

Subject-verb agreement

Noun-pronoun agreement

Misplaced modifiers

Articles

Prepositions

Redundancies

Clichés

UNIT-IV

4. Nature and Style of sensible Writing:

Describing

Defining

Classifying
Providing examples or evidence
Writing introduction and conclusion

5. Writing Practices:
Comprehension
Précis Writing
Essay Writing

Recommended Books:

1. Michael Swan, 'Practical English Usage', OUP, **1995**.
2. F.T. Wood, 'Remedial English Grammar', Macmillan, **2007.**
3. William Zinsser, 'On Writing Well', Harper Resource Book, **2001.**
4. Liz Hamp-Lyons and Ben Heasly, 'Study Writing', Cambridge University Press, **2006**.
5. Sanjay Kumar and Pushp Lata, 'Communication Skills', Oxford University Press, **2011**.
6. 'Exercises in Spoken English', Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

Course Outcomes:

1. The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

PROGRAMMING FOR PROBLEM SOLVING

Subject Code: BCSCE0-101 **L T P C** **Duration: 41 Hrs.**
3 0 0 3

UNIT-I

1. Introduction to Programming: (6 Hrs.)
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

2. Arithmetic Expressions and Precedence: (12 Hrs.)
Conditional Branching and Loops. Writing and evaluation of conditionals and consequent branching. Iteration and loops.

UNIT-II

3. Arrays: (5 Hrs.)
Arrays (1-D, 2-D), Character arrays and Strings

4. Basic Algorithms: (5 Hrs.)
Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT-III

5. Function: (4 Hrs.)
Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

6. Recursion: (4 Hrs.)
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-IV

7. Structure: (3 Hrs.)
Structures, Defining structures and Array of Structures

8. Pointers: (2 Hrs.)
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)
9. File Handling: (only if time is available, otherwise should be done as part of the lab)
Recommended Text Books:
1. Byron Gottfried, 'Schaum's Outline of Programming with C', McGraw Hill.
2. E. Balaguruswamy, 'Programming in ANSI C', Tata McGraw Hill.

Recommended Reference Books:
1. Brian W. Kernighan and Dennis M. Ritchie, 'The C Programming Language', Prentice Hall of India.

Course Outcomes:
The student will learn
1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

CHEMISTRY-I LAB.

Subject Code: BCHEM0-101 **L T P C**
0 0 2 1

Course Objectives:
1. To learn the preparation and standardization of solutions
2. To learn the estimation of various physical properties of given liquid samples
3. To estimate various crucial parameters for water sample
4. To learn the preparation of various molecules and detection of functional groups.

Choice of 10-12 experiments from the following:
1. Preparation of a standard solution
2. Determination of surface tension and viscosity
3. Thin layer chromatography
4. Determination of total Alkalinity/ Acidity of a water sample.
5. Determination of residual chlorine in water sample
6. Estimation of total, temporary and permanent hardness of water
7. Determination of the rate constant of a reaction
8. Determination of strength of an acid conductometrically
9. Potentiometry - determination of redox potentials and emfs
10. Synthesis of a polymer
11. Saponification /acid value of an oil
12. Detection and confirmation of organic functional groups.
13. Models of spatial orientation
14. To test the validity of Lambert Beer law/ Determination of λ_{max} / Determination of unknown concentration of a solution.
15. Determination of the partition coefficient of a substance between two immiscible

liquids
16. Adsorption of acetic acid by charcoal
17. Synthesis of a drug – Acetaminophen, Aspirin

Laboratory Outcomes:

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

1. Estimate rate constants of reactions from concentration of reactants/products as a function of time
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
3. Synthesize a small drug molecule and analyze a salt sample

ENGLISH LAB.

Subject Code: BHUMA0-102 **L T P C**
0 0 2 1

Oral Communication

(This unit involves interactive practice sessions in Language Lab.)

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

PROGRAMMING FOR PROBLEM SOLVING LAB.

Subject Code: BCSCE0-102 **L T P C**
0 0 4 2

NOTE: The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Laboratory Outcomes:

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining self-referential structures.
8. To be able to create, read and write to and from simple text files.

MANUFACTURING PRACTICES (THEORY & LAB.)

Subject Code: BMFPR0-101 **L T P C** **Duration: 80 Hrs.**
1 0 4 3

Lectures & Videos: (10 Hrs.)

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing Methods.
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.
4. Sheet Metal Operations.
5. Electrical & Electronics.
6. Carpentry.
7. Plastic moulding (injection moulding, blow moulding, extrusion moulding), glass cutting.
8. Metal casting.
9. Welding (arc welding & gas welding), brazing.

Recommended Text/Reference Books:

1. S.K. Hajra Choudhury, A.K. Hajra Choudhury and S.K. Nirjhar Roy, 'Elements of Workshop Technology', Vol.-I, **2008** and Vol.-II **2010**, Media Promoters and Publishers Pvt. Ltd., Mumbai.
2. S. Kalpakjian, Steven S. Schmid, 'Manufacturing Engineering and Technology', 4th Edn., Pearson Education India Edn., **2002**.
3. Gowri P. Hariharan and A. Suresh Babu, 'Manufacturing Technology – I', Pearson, **2008**.
4. Roy A. Lindberg, 'Processes and Materials of Manufacture', 4th Edn., Prentice Hall India, **1998**.
5. P.N. Rao, 'Manufacturing Technology', Vol.-I and Vol.-II, Tata McGraw Hill House, **2017**.

Course Outcomes:

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Workshop Practice: (70 Hrs.)

1. Machine shop **(10 Hrs.)**
2. Fitting shop **(8 Hrs.)**

3. Carpentry **(6 Hrs.)**
4. Electrical & Electronics **(8 Hrs.)**
5. Welding shop **(8 Hrs. (Arc welding 4 Hrs. + Gas welding 4 Hrs.)**
6. Casting **(8 Hrs.)**
7. Sheet Metal Operations **(10 Hrs.)**
8. Smithy **(6 Hrs.)**
9. Plastic moulding & Glass Cutting **(6 Hrs.)**
10. Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Laboratory Outcomes:

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

HUMAN VALUES AND PROFESSIONAL ETHICS

Subject Code: BHUMA0-103 **L T P C** **Duration: 30 Hrs.**
3 0 0 0

UNIT-I (8 Hrs.)

Meaning of values, Values as social fact, Universal values – equality, justice, freedom/ liberty, inclusion. Distinction between social and culture values and values associated with crafts and occupations. Work and leisure as values – Marx and Veblen

UNIT-II (9 Hrs.)

Values, morality, ethics and their relation with Religion, values as mechanisms of control and coercion. Functional Theory of Values of Talcott Parsons, Theory of Basic Values of Shalom Schwartz, Theory of Protestant Ethic and Capitalism of Max Weber, Bhagwat Gita and Theory of Karma-Dharma, Sikhism and theory of work, dignity of labour, meditation and sharing.

UNIT-III (7 Hrs.)

Meaning and types of Professional Ethics, Goals of professional work and their problems, Normative and evaluative elements in professional work, Duties and obligations, Professional rights, Virtues in professional life (honesty, trustworthiness, transparency, competence, integrity and exemplary conduct), Engineering ethics and service ideals.

UNIT-IV (6 Hrs.)

Technology for and against mankind and environment- fulfilment of human needs, and industrial disasters: case studies – Bhopal Gas Tragedy, Chernobyl and Fukushima Disasters; Equality at work place: gender discrimination and caste/class-based exclusions.

Recommended Books:

1. Schwartz, H. Shalom, 'An Overview of the Schwartz Theory of Basic Values'. Online Readings in Psychology and Culture. **2** (1). doi:10.9707/2307-0919.1116, **2012**.
2. John Berry, Janek, Pandey; Poortinga, Ype 'Handbook of Cross-cultural Psychology', 2nd Edn.. Boston, MA: Allyn and Bacon. p. 77. ISBN 9780205160747, **1997**.
3. Timo Airaksinen, 'The Philosophy of Professional Ethics', University of Helsinki, Finland.
4. Manju Jitendra Jain, 'Yes, It's Possible', Kalpana Publications, Mumbai, **2011**.

INTRODUCTION TO COMPUTER SCIENCE & ENGINEERING

Subject Code: BCOBE0-101 **L T P C** **Duration: 24 Hrs.**
2 0 0 0

UNIT-I

Introduction to Computer Science & Engineering, Difference between science & engineering, Applications of Computer Science & engineering.

UNIT-II

Different branches/fields of Computer Science, Scope of Computer Science in industry, self-employment etc.

UNIT-III

Introduction to Computer, parts of computer system. Difference between Hardware & software, Configuration of computer systems, Types of memory-RAM, ROM, Introduction to UPS-Online and Offline, printers etc.

UNIT-IV

Different types of Software- Application software and System Software, Types of Languages-High level and low level languages, Introduction to Operating System.

INTRODUCTION TO TEXTILE ENGINEERING

Subject Code: BCOBE0-101 **L T P C** **Duration: 24 Hrs.**
2 0 0 0

UNIT-I

Introduction to Textile Engineering/Technology, Basic terminologies related to Textile fibres, Yarn manufacturing, Fabric manufacturing and Wet processing etc., Job & Entrepreneurial opportunities of Textile Technologists.

UNIT-II

Process flow of fibres up to finished product. Types of Textile fibres, their introduction and simple classification.

UNIT-III

Process flow of conventional yarn manufacturing, introduction and objectives of various processes involved. Process flow of weaving process, introduction and objectives of various fabric manufacturing processes.

UNIT-IV

Process flow in wet processing, Elementary idea about the objects of each process used in wet processing.

Recommended Books:

1. V.A. Senhai, 'Textile Fibres', Vol-1, Bombay Sevak Publishers, **1995**.
2. W. Klein, 'Manual of Textile Tech.', Textile Institute, **1995**.
3. T.K. Pattabhiram, 'Essential Elements of Textile Calculations', 2nd Edn., Textile Trade Press Ahmedabad.
4. Textile Science, 'Gohl & Valenski', 1st Indian Edn., CBS Publishers, **1987**.