

**GROUP-A**  
**1<sup>ST</sup> SEMESTER**

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHYS5-101	Physics (Optics, Electromagnetism & Quantum Mechanics)	3	1	0	40	60	100	4
BMATH5-101	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
BPHYS5-102	Physics (Optics, Electromagnetism & Quantum Mechanics) 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
<b>Total</b>		<b>16</b>	<b>3</b>	<b>10</b>	<b>540</b>	<b>360</b>	<b>900</b>	<b>19</b>

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.

**2<sup>ND</sup> 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
BMATH5-201	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
<b>Total</b>		<b>15</b>	<b>2</b>	<b>12</b>	<b>500</b>	<b>400</b>	<b>900</b>	<b>20</b>

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 3<sup>rd</sup> Semester

**GROUP-B**  
**1<sup>ST</sup> 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
BMATH5-101	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		17	2	12	600	400	1000	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.

**2<sup>ND</sup> SEMESTER**

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Internal	External	Total	
BPHYS5-101	Physics (Optics, Electromagnetism & Quantum Mechanics)	3	1	0	40	60	100	4
BMATH5-201	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
BPHYS5-102	Physics (Optics, Electromagnetism & Quantum Mechanics) 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		14	3	10	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 3<sup>rd</sup> Semester

**PHYSICS (OPTICS, ELECTROMAGNETISM & QUANTUM MECHANICS)**

**Subject Code: BPHYS5-101**

**L T P C**  
**3 1 0 4**

**Duration: 38 Hrs.**

**UNIT-I**

**Optics: (12 Hrs.)**

Introduction to Interference and example; Concept of diffraction, Fraunhofer and Fresnel diffraction; Fraunhofer diffraction at a single slit (concept only), double slit and multiple slits; Diffraction grating, characteristics of the diffraction grating and its applications. Polarization by reflection, scattering of light, circular and elliptical polarization, optical activity.

**UNIT-II**

**Fibre Optics and LASER: (8 Hrs.)**

Optical fibre, Acceptance angle, Numerical aperture, Modes of propagation, losses associated with optical fibres, Step and graded index fibres, Applications of optical fibres. Introduction to LASER, Principle and working of laser, population inversion, pumping, various modes, different types of lasers: gas lasers (He-Ne), solid-state lasers (Ruby), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, applications of lasers in science, engineering and medicine.

**UNIT-III**

**Electromagnetism and Magnetic Properties of Materials: (8 Hrs.)**

Laws of Electrostatics, Electric current and the continuity equation, Laws of Magnetism, Ampere's and Faraday's law, Maxwell's equations, Magnetisation, permeability and Susceptibility, Classifications of magnetic materials: Diamagnetic, Paramagnetic, Ferromagnetic & Ferrimagnetic, Magnetic domains and Hysteresis.

**UNIT-IV**

**Quantum Mechanics (10 Hrs.)**

Introduction to Quantum mechanics, Wave nature of particles, De Broglie's concept, Time-dependent and time-independent Schrodinger equation for wave-function, probability current, Free-particle wave-function and wave-packets, Uncertainty principle, application of uncertainty principle: non-existence of electron in the nucleus, expectation value. Schrodinger equation for one dimensional problems– particle in a box, linear harmonic oscillator.

**Recommended Books:**

1. David Griffiths, 'Introduction to Electrodynamics'.
2. Gupta & Gaur, 'Engineering Physics'.
3. Ian G. Main, 'Oscillations and Waves in Physics'.
4. H.J. Pain, 'The Physics of Vibrations and Waves'.
5. A. Ghatak, 'Optics'.
6. O. Svelto, 'Principles of Lasers'.
7. Satyaparkash, 'Quantum Mechanics'.
8. A. Ghatak and Lokanathan, 'Quantum Mechanics'.

**MATHEMATICS-I (CALCULUS, LINEAR ALGEBRA)**

**Subject Code: BMATH5-101**

**L T P C**  
**3 1 0 4**

**Duration: 46 Hrs.**

**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', 9<sup>th</sup> Edn., Pearson, Reprint, **2002**.
2. Erwin Kreyszig, 'Advanced Engineering Mathematics', 9<sup>th</sup> 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', Tata McGraw Hill, New Delhi, 11<sup>th</sup> Reprint, **2010**.
5. D. Poole, 'Linear Algebra: A Modern Introduction', 2<sup>nd</sup> Edn., Brooks/Cole, **2005**.
6. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, 36<sup>th</sup> Edn., **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**  
**2 0 0 2**

**Duration: 30 Hrs.**

**1. Introduction**

Engineering Drawing/Engineering Graphics/Technical Drawing - a Visual Science. Types of Engineering Drawing, Introduction to drawing equipment and use of instruments. Symbols and conventions in drawing Practice. Types of lines and their use, BIS codes for lines, Technical lettering as per BIS codes, Introduction to Dimensioning, Concepts of scale in drawing, Types of scales. Basic Definition of geometrical objects: Points, lines, planes and solids.

2. Theory of Projections - Relevance of projection, Type of projections, Perspective, Orthographic, Axonometric and their basic principles, System of orthographic projection: in reference to quadrants and octants, illustration through simple problems of projection.

3. Projection of Points- Projection of points in quadrants and octants. Projection of point on Auxiliary planes.

4. Projection of Lines -Parallel to both H P and V P, Parallel to one and inclined to other, and inclined to both, contained in profile plane. True length and angle orientation of straight line: rotation method and auxiliary plane method. Distance between two nonintersecting lines, and trace of line.

5. Projection of Planes- Difference between plane and lamina. Projection of lamina Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, and Lamina oblique to three reference planes. Application of auxiliary planes, and trace of planes.

6. Projection of Solids- Definition of solids, types of solids, and elements of solids. Projection of solids in first or third quadrant, with axis parallel to one and perpendicular to other, axis parallel to one inclined to other, axis inclined to both the principle plane, axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible details in the projection. Use rotation and auxiliary plane method to draw the projections.

7. Section of Solids Definition of Sectioning and its purpose. Procedure of Sectioning, Types of sectional planes. Illustration through examples.

8. Development of Surface Purpose of development, Parallel line, radial line and triangulation method. Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, and development of surface of sphere.

9. Isometric Projection Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric

projection of solids such as cube, prism, pyramid and cylinder, and assignments on isometric projection of simple machine parts.

10. Orthographic Projection Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts.

### 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. Kanniah, 'Text book on Engineering Drawing', Scitech Publishers, 2008.

## 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 (OPTICS, ELECTROMAGNETISM & QUANTUM MECHANICS) LAB.**

Subject Code: BPHYS5-102

L T P C  
0 0 2 1

**Note: Student's will have to perform at least 10 experiments from the given topic/list.**

**Experiments based on Optics, Electromagnetism & Quantum Mechanics:**

1. To study the magnetic field of a circular coil carrying current.
2. To find out polarizability of a dielectric substance.
3. To study the laser beam characteristics like; wave length using diffraction grating element.
4. Study of diffraction using Laser beam and thus to determine the grating element.
5. To study the angular divergence of laser beam.
6. To study laser interference using double slit or Michelson's Interferometer.
7. To determine numerical aperture of an optical fibre.
8. To determine attenuation and propagation losses in optical fibres.
9. To find out the frequency of AC mains using electric-vibrator.
10. To find the refractive index of a material (solid or liquid) using spectrometer.
11. To study the B-H curve using CRO.
12. To determine the grain size of a material using optical microscope.
13. To find the velocity of ultrasound in liquid.
14. To determine unknown capacitance by flashing and quenching method.
15. To study the Characteristics of a Series RC Circuit.
16. To determine the self-inductance of the coil (L) using Anderson's bridge.
17. To understand the phenomenon Photoelectric effect as a whole.

**Physics Virtual Lab Experiments:**

18. To calculate the beam divergence and spot size of the given laser beam.
19. To determine the wavelength of a laser using the Michelson interferometer.
20. To set up and observe Newton's rings.
21. To determine the wavelength of the given source.
22. To understand the phenomenon Photoelectric effect as a whole.
23. To draw kinetic energy of photoelectrons as a function of frequency of incident radiation.
24. To determine the Planck's constant from kinetic energy versus frequency graph.
25. To plot a graph connecting photocurrent and applied potential.
26. To determine the stopping potential from the photocurrent versus applied potential graph.

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

**ENGINEERING GRAPHICS & DESIGN LAB.**

**Subject Code: BMECE0-102**

**L T P C**  
**0 0 6\* 3**

**Duration: 45 Hrs.**

**1. 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 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];

**2. 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;

**3. 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.

\* Lab work will be performed in two parts:

- (i) **Computer Lab (2 hours)** Computer Graphics, CAD Drawing etc.
- (ii) **Drawing Hall (4 hours)** Manual practice on drawing sheets of theory content the relevant theory part of Engineering Graphics & Design may also be covered in Lab work.

**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  
3 0 0 0

Duration: 30 Hrs.

**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<sub>3</sub>, 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 –  $\beta$  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', 5<sup>th</sup> 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: BMATH5-201

L T P C  
3 1 0 4

Duration: 40 Hrs.

**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  
2 0 0 2**

**Duration: 25 Hrs.**

**UNIT-I**

**1. Vocabulary Building:**

- 1.1 The concept of Word Formation
- 1.2 Root words from foreign languages and their use in English
- 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
- 1.4 Synonyms, antonyms, and standard abbreviations.

**UNIT-II**

**2. Basic Writing Skills:**

- 2.1 Sentence Structures
- 2.2 Use of phrases and clauses in sentences
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence
- 2.5 Organizing principles of paragraphs in documents
- 2.6 Techniques for writing precisely

**UNIT-III**

**3. Identifying Common Errors in Writing:**

- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement
- 3.3 Misplaced modifiers
- 3.4 Articles
- 3.5 Prepositions
- 3.6 Redundancies
- 3.7 Clichés

**UNIT-IV**

**4. Nature and Style of sensible Writing:**

- 4.1 Describing
- 4.2 Defining
- 4.3 Classifying
- 4.4 Providing examples or evidence
- 4.5 Writing introduction and conclusion

**5. Writing Practices:**

- 5.1 Comprehension
- 5.2 Précis Writing
- 5.3 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 Heasley, '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 root 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  $\lambda_{\max}$  / 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', 4<sup>th</sup> 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', 4<sup>th</sup> 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', 2<sup>nd</sup> 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**.