

SEMESTER 1

Sl. No	Subject Code	Course Name	L	T	P	Credit
Theory						
1	BSH101	Physics	3	-	-	3
2	BSH102	Mathematics -I	3	1	-	4
3	BSH103	Basic Electrical Engineering	3	-	-	3
4	BSH104	Engineering Graphics and design	1	-	-	1
5	BSH105	Technical English	2	-	-	2
6	BSH106	Environmental Science	3	-	-	3
7	BSH107	IDEA lab Workshop	2	-	-	0
Practical						
1	BSH111	Physics Lab	-	-	2	1
2	BSH112	Engineering Graphics and design lab	-	-	4	2
3	BSH113	Design Thinking Lab	-	-	2	1
4	BSH114	Technical English Lab	-	-	2	1
5	BSH115	IDEA lab Workshop	-	-	4	0
			17	1	14	21

SEMESTER 2

Sl. No	Subject Code	Course Name	L	T	P	Credit
Theory						
1	BSH201	Chemistry	3	-	-	3
2	BSH202	Mathematics-II	3	1	-	4
3	BSH203	Programming for Problem solving	3	-	-	3
4	BSH204	Basic Electronics	3	-	-	3
5	BSH205	Manufacturing Practices	1	-	-	1
6	BSH206	Sports and Yoga	2	-	-	0
7	BSH207	Universal Human values-II: Understanding Harmony and Ethical Human Conduct	2	1	-	3
Practical						
1	BSH211	Chemistry Lab	-	-	2	1
2	BSH212	Programming for Problem solving lab	-	-	4	2
3	BSH213	Basic Electronics Lab	-	-	2	1
4	BSH214	Manufacturing Practices Lab	-	-	4	2
			17	2	12	23

Detail Syllabus

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH101	Physics	3	3	-	2
<p>UNIT-1: Electrostatics Gauss law and its integral and differential forms, applications, Poisson and Laplace equations, Maxwell's equations, Basic concepts of Electromagnetic Waves and its solution in free space, electrostatic field and potential of a dipole, Poynting vector.</p> <p>UNIT-2: Magnetostatics Lorentz force, Biot-savart and Ampere's laws and their applications, Divergence and Curl of Magnetostatic fields, Magnetic vector Potential and torque on a magnetic dipole, magnetic materials and Magnetization, magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials.</p> <p>UNIT-3: Mechanics Overview of Newtonian mechanics in rectilinear coordinate system, conservation principles, non-inertial frame and pseudo forces, rigid body dynamics, postulates of special theory of relativity, Lorentz transformation equation of space and time, length contraction, time dilation, addition of velocities, variation of mass with velocity, mass-energy equivalence.</p> <p>UNIT-4: Quantum Mechanics Introduction to Quantum mechanics, wave particle duality, de Broglie concept of matter waves, Heisenberg uncertainty principle, Time-dependent and time independent Schrodinger wave equation, Probabilities and Normalization, expectation values, Eigen values and Eigen functions, applications in one dimensions, particle in a box, finite potential well and harmonic oscillator.</p> <p>UNIT-5: Wave, Oscillations and Optics Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator, quality factor, forced mechanical and electrical oscillations, coherent sources, conditions for interference, newtons rings, Fraunhofer diffraction from a single slit and a circular aperture, Einstein theory of matter radiation interaction and A and B coefficients, different types of lasers-gas lasers, solid lasers, dye lasers, properties of laser beams.</p>					
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. "Introduction to Electrodynamics" by David J. Griffiths, published by Cambridge University Press. 2. "Classical Mechanics" by J.C. Upadhyaya, published by Himalaya Publishing House. <p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. "Quantum Mechanics: Concepts and Applications" by Nouredine Zettili, from John Wiley & Sons 2. "Optics" by Ajoy Ghatak, published by McGraw Hill Education. 3. "Physics for Scientists and Engineers" by Raymond A. Serway and John W. Jewett, from Cengage Learning. 4. "Fundamentals of Physics" by Halliday, Resnick, and Walker, published by Wiley. 5. "Engineering Physics" by H.K. Malik and A.K. Singh, from McGraw Hill Education. 6. "Optics and Modern Physics" by Murugesan R., published by S. Chand Publishing. 					

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH102	Mathematics -I	4	3	1	
<p>Unit 1: Basic Calculus: Curvature, evolutes and involutes; 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.</p> <p>Unit 2: Single-variable Calculus (Differentiation): Rolle's Theorem, Mean value theorems and applications; Extreme values of functions; Linear approximation; Indeterminate forms and L'Hospital's rule.</p> <p>Unit 3: Sequences and series: Limits of sequence of numbers, Calculation of limits, Infinite series; Tests for convergence; Power series, Taylor and Maclaurin series; Taylor theorem, convergence of Taylor series, error estimates.</p> <p>Unit 4: Multivariable Calculus (Differentiation): Limit, continuity and partial derivatives, directional derivatives, gradient, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.</p> <p>Unit 5: Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Gradient, curl and divergence, Theorems of Green, Gauss and Stokes.</p>					
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. AICTE's Prescribed Textbook: Mathematics-I (Calculus & Linear Algebra), Khanna Book Publishing Co. 2. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022. 3. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021. 4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. <p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008. 5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010. 					

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH103	Basic Electrical Engineering	4	3	1	
<p>Unit 1: D. C. Circuits covering, Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits excited by independent voltage sources; Power and energy; Electromagnetism covering, Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced EMF; Concepts of self-inductance, mutual inductance and coefficient of coupling; Energy stored in magnetic fields;</p> <p>Unit 2: Single Phase A.C. Circuits covering, Generation of sinusoidal voltage- definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series- parallel circuits; Three Phase A.C. Circuits covering, Necessity and Advantages of three phase systems, Generation of three phase power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits, measurement of power by two wattmeter method;</p> <p>Unit 3: Transformers covering, Principle of operation and construction of single phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation; Synchronous Generators covering, Principle of operation; Types and constructional features; EMF equation;</p> <p>Unit 4: DC Machines covering, working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, relation between EMF induced and terminal voltage enumerating the brush drop and drop due to armature reaction; DC motor working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics and applications; Necessity of a starter for DC motor;</p> <p>Unit 5: Three Phase Induction Motors covering; Concept of rotating magnetic field; Principle of operation, types and constructional features; Slip and its significance; Applications of squirrel cage and slip ring motors; Necessity of a starter, star-delta starter.</p> <p>Unit 6: Sources of Electrical Power covering, Introduction to Wind, Solar, Fuel cell, Tidal, Geothermal, Hydroelectric, Thermal-steam, diesel, gas, nuclear power plants; Concept of cogeneration, and distributed generation;</p>					
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. AICTE's Prescribed Textbook: Basic Electrical Engineering, Khanna Book Publishing. 2. Ritu Sahdev (2022), Basic Electrical Engineering, Khanna Book Publishing. 3. Nagrath I.J. and D. P. Kothari (2001), Basic Electrical Engineering, Tata McGraw Hill. <p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Hayt and Kimberly, Engineering Circuit Analysis, Tata McGraw Hill. 2. Kulshreshtha D.C. (2009), Basic Electrical Engineering, Tata McGraw Hill. 3. Rajendra Prasad (2009), Fundamentals of Electrical Engineering, Prentice Hall, India Hughes, E. 4. Mittel & Mittal, Basic Electrical Engineering, Tata McGraw Hill. 					

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH104	Engineering Graphics and design	1	1		4
<p>UNIT-1: INTRODUCTION TO ENGINEERING DRAWINGS AND ORTHOGRAPHIC PROJECTIONS Principles of Engineering Graphics and their significance. Dimensioning, Lettering. Scales: Plain, Diagonal and Engineering Scales. Engineering curves: Classification of engineering curves. Cycloid, involute and spiral curves. Loci of points: Simple mechanism like slider crank mechanism four bar chain mechanism etc. Orthographic Projection, Projection of Point, Projection of Lines: Projection of straight lines; Projection of lines inclined to one plane and both planes.</p> <p>UNIT-2: PROJECTION OF PLANES AND SOLIDS Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.</p> <p>UNIT 3: SECTIONS OF REGULAR SOLIDS AND DEVELOPMENT OF SURFACES Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.</p> <p>UNIT-4: ISOMETRIC PROJECTION 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</p> <p>UNIT-5: INTRODUCTION TO COMPUTER AIDED DESIGN Introduction to computer aided design: Advantage of CAD, elements of CAD, components of computer, input and output devices, type of software, basic functions drafting software. Basic commands for 2D drawing: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, and Offset, Dim style, etc. Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form.</p>					
<p>TEXT BOOKS: 1. Engineering Drawing by M.B. Shah and B.C. Rana, Pearson publishers</p> <p>REFERENCES BOOKS: 2. Engineering Drawing by Dhananjay A. Jolhe, Tata McGraw Hill Publishers 3. Engineering Graphics for Degree by K.C. John, PHI Publishers</p>					

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH105	Technical English	2	2		

UNIT 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 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 3: IDENTIFYING COMMON ERRORS IN WRITING

Subject-verb agreement; Noun-pronoun agreement; Misplaced modifiers; Articles; Prepositions; Redundancies; Clichés

UNIT 4: NATURE AND STYLE OF SENSIBLE WRITING

Describing; Defining; Classifying; Providing examples or evidence; Writing introduction and conclusion

UNIT 5: WRITING PRACTICES

Comprehension; Précis Writing; Essay Writing

UNIT 6: ORAL COMMUNICATION

(This Module involves interactive practice sessions in Language Lab)

Listening Comprehension; Pronunciation, Intonation, Stress and Rhythm; Common Everyday Situations: Conversations and Dialogues; Communication at Workplace; Interviews; Formal Presentations

TEXT BOOKS:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001

REFERENCES BOOKS:

1. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
2. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH106	Environmental Science	3	3		

UNIT 1: ENVIRONMENT AND ECOSYSTEMS

Environmental education: definition - scope - objectives and importance. Concept of an ecosystem –types (terrestrial and aquatic ecosystems) – structure and function – ecological succession - food chains, food webs and ecological pyramids

UNIT 2: BIODIVERSITY

Introduction: definition - genetic, species and ecosystem diversity - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife - endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

UNIT 3: POLLUTION AND WASTE MANAGEMENT

Classification of pollutants and their effects. Air and water pollution — causes, effects and control measures. Waste water treatment (general) – primary, secondary & tertiary stages. Solid waste management: causes - effects of municipal waste, hazardous waste, bio medical waste - process of waste management.

UNIT 4: CURRENT ENVIRONMENTAL ISSUES

Environmental ethics -issues and possible solutions- population explosion, climatic change, ozone layer depletion, global warming, acid rain and green house effect. Sustainable development: definition, objectives and environmental dimensions of sustainable development- environmental audit for sustainable development.

UNIT 5: ENVIRONMENTAL PROTECTION

National and international concern for environment: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act – functions of central and state pollution control boards - international effort – key initiatives of Rio declaration, Vienna convention, Kyoto protocol and Johannesburg summit. Concept of Green Chemistry and Green engineering

TEXT BOOKS:

1. Sharma.B.K. and Kaur, “Environmental Chemistry”“ Goel Publishing House, Meerut, 1994.
2. De.A.K., “Environmental Chemistry”, New Age International (p) It., , New Delhi, 1996.

REFERENCES BOOKS:

1. Kurian Joseph & R. Nagendran, “Essential of Environmental Studies”“ Pearson Education, 2004.
2. Dara S.S., A Text Book of Environmental Chemistr y and pollution control, S.Chand & Company Ltd., New Delhi, 2004.

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH107	IDEA lab Workshop	0	2		4
Unit	Topics				
1	Electronic component familiarization, Understanding electronic system design flow. Schematic design and PCB layout and Gerber creation using EagleCAD. Documentation using Doxygen, Google Docs, Overleaf. Version control tools - GIT and GitHub. Basic 2D and 3D designing using CAD tools such as FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace, OpenBSP and VeriCUT.		Introduction to basic hand tools - Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading. Adhesives Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools. Various types of drill bits,		
2	Familiarization and use of basic measurement instruments - DSO including various triggering modes, DSO probes, DMM, LCR bridge, Signal and function generator. Logic analyzer and MSO. Bench power supply (with 4-wire output) Circuit prototyping using (a) breadboard, (b) Zero PCB (c) 'Manhattan' style and (d) custom PCB. Single, double and multilayer PCBs. Single and double-sided PCB prototype fabrication in the lab. Soldering using soldering iron/station. Soldering using a temperature controlled reflow oven. Automated circuit assembly and soldering using pick and place machines.		Mechanical cutting processes - 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc. Basic welding and brazing and other joining techniques for assembly. Concept of Lab aboard a Box.		
3	Electronic circuit building blocks including common sensors. Arduino and Raspberry Pi programming and use. Digital Input and output. Measuring time and events. PWM. Serial communication. Analog input. Interrupts programming. Power Supply design (Linear and Switching types), Wireless power supply, USB PD, Solar panels, Battery types and charging		3D printing and prototyping technology – 3D printing using FDM, SLS and SLA. Basics of 3D scanning, point cloud data generation for reverse engineering. Prototyping using subtractive cutting processes. 2D and 3D Structures for prototype building using Laser cutter and CNC routers. Basics of IPR and patents; Accessing and utilizing patent information in IDEA Lab		
4	Discussion and implementation of a mini project				
5	Documentation of the mini project (Report and video).				

TEXTBOOKS:

1. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.
2. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan (Author). Weldon Owen; 2017. ISBN-13: 978-1681881584.
3. Make: Tools: How They Work and How to Use Them. Platt, Charles. Shroff/Maker Media. 2018. ISBN-13: 978-9352137374
4. The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press. ISBN: 9780521809269
5. Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill. ISBN-13: 978-1259587542
6. Encyclopedia of Electronic Components (Volume 1, 2 and 3). Charles Platt. S
7. Building Scientific Apparatus. 4th edition. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer. Cambridge University Press. ISBN-13: 978-0521878586

REFERENCES BOOKS:

1. Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk. McGraw Hill. ISBN-13: 978-1259641633
2. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education. ISBN-13 : 9781260019193.
3. Pro GIT. 2nd edition. Scott Chacon and Ben Straub. A press. ISBN-13 : 978-1484200773
4. Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer, 2004.
5. Ian Gibson, David W Rosen, Brent Stucker., “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010
6. Chapman W.A.J, “Workshop Technology”, Volume I, II, III, CBS Publishers and distributors, 5th Edition,2002.

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH113	Design thinking	1			2

Unit 1: An Insight to Learning

Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting

Unit 2: Remembering Memory

Understanding the Memory process, Problems in retention, Memory enhancement techniques

Unit 3: Emotions: Experience & Expression

Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers

Unit 4: Basics of Design Thinking

Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

Unit 5: Being Ingenious & Fixing Problem

Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

Unit 6: Process of Product Design

Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design

Unit 7: Prototyping & Testing

What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, **Sample Example**, Test Group Marketing

Unit 8: Celebrating the Difference

Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

Unit 9: Design Thinking & Customer Centricity

Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design

Unit 10: Feedback, Re-Design & Re-Crete

Feedback loop, Focus on User Experience, Address “ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – **“Solving Practical Engineering Problem through Innovative Product Design & Creative Solution”**.

TEXTBOOKS/REFERENCES:

1. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company.

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH201	Chemistry	3	3		2

UNIT 1: GENERAL CHEMISTRY

a) Atomic and Molecular Structure; Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. 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.

b) Periodic properties; 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, molecular geometries.

c) Phase rule and its application to one component system.

UNIT 2: USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

UNIT 3: STEREOCHEMISTRY

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

UNIT 4: ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE

Inductive effect, resonance, Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

UNIT 5: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging. Diffraction and scattering

TEXT BOOKS:

1. *AICTE's Prescribed Textbook: Chemistry – I with Lab Manual*, Khanna Book Publishing.
2. Engineering Chemistry, by Manisha Agrawal.
3. University chemistry, by B. H. Mahan
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell

REFERENCES BOOKS:

1. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
2. Physical Chemistry, by P. W. Atkins
3. Organic Chemistry: Structure and Function by K. P. C.
<http://bcs.whfreeman.com/vollhardtschore5e/default.asp>

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH202	Mathematics-II	4	3	1	
<p>UNIT 1: MATRICES Linear Systems of Equations; Linear Independence; Rank of a Matrix; Determinant, Inverse of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Orthogonal transformation; Diagonalization of matrices; Cayley-Hamilton Theorem.</p> <p>UNIT 2: FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS Exact, linear and Bernoulli's equations. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.</p> <p>UNIT 3: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS Second order linear differential equations with variable coefficients: Euler-Cauchy equations, solution by variation of parameters; Power series solutions: Legendre's equations and Legendre polynomials, Frobenius method, Bessel's equation and Bessel's functions of the first kind and their properties.</p> <p>UNIT 4: COMPLEX VARIABLE – DIFFERENTIATION Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.</p> <p>UNIT 5: COMPLEX VARIABLE – INTEGRATION Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.</p>					

TEXT BOOKS:

1. AICTE's Prescribed Textbook: Mathematics-II (Calculus, Ordinary Differential Equations and Complex Variable), Khanna Book Publishing Co.
2. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
3. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2006.

REFERENCES BOOKS:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH203	Programming for Problem solving	3	3		4

Unit 1: Introduction to Programming; 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.

Unit 2: Arithmetic expressions and precedence.

Unit 3: Conditional Branching and Loops. Writing and evaluation of conditionals and consequent branching. Iteration and loops.

Unit 4: Arrays, Arrays (1-D, 2-D), Character arrays and Strings

Unit 5: Basic Algorithms, 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 6: Function, Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference Recursion, 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 7 Structures, Defining structures and Array of Structures

Unit 8: Pointers, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit 9: File handling (only if time is available, otherwise should be done as part of the lab).

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.

REFERENCES BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH204	Basic Electronics	3	3		2

UNIT 1: SEMICONDUCTOR DIODES

Semiconductor materials- intrinsic and extrinsic types, Ideal Diode, Terminal characteristics of diodes: p-n junction under open circuit condition, p-n junction under forward bias and reverse bias conditions, p-n junction in breakdown region, Zener diode and applications, Rectifier Circuits, Clipping and Clamping circuits

UNIT 2: BIPOLAR JUNCTION TRANSISTORS (BJTS)

Physical structure and operation modes, Active region operation of transistor, Transistor as an amplifier, Basic BJT amplifier configuration: common emitter, common base and common collector amplifiers, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias, Transistor as a switch: cut-off and saturation modes

UNIT 3: FIELD EFFECT TRANSISTOR (FET)

Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics, Depletion-type MOSFET, Basic MOSFET amplifier configuration: common source, common gate and common drain types, Junction Field-Effect Transistor (JFET)

1. Amplifiers and Oscillators

Single Stage CE Amplifier , decibels and half power points., The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley Colpitts and crystal oscillator using FET. Expression for output frequency

2. Operation Amplifier (Op-amps)

Ideal Op-amp, Differential amplifier: differential and common mode operation common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non -inverting amplifier, Other applications of op-amps: voltage follower, addition, subtraction, integration and differentiation

TEXT BOOKS:

1. R.P. Jain, “ Modern Digital Electronics “ TMH, 3rd Ed, 2004.
2. Morris Mano, “ Digital Design “, PHI, 2nd Ed, 2002.

REFERENCES BOOKS:

1. R.J. Tocci, “ Digital Systems”, PHI,2000.
2. Malvino and Leach, “ Digital principles and applications”, TMH, 2000.
3. I.J. Nagrath ,” Electronics, Analog & Digital”, PHI, 1999.
4. J.M. Yarbrough, “ Digital Logic-Application and Design “, PWS publishing,1999.
5. B.S. Nai,” Digital Electronics and Logic Design “, PHI, 2000.
6. Balabanian and Carlson, “ Digital Logic Design principles”, Wiley pub., 2000.

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH205	Manufacturing Practices	1	1		
<p>UNIT 1: Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.</p> <p>UNIT 2: CNC machining, Additive manufacturing.</p> <p>UNIT 3: Fitting operations & power tools.</p> <p>UNIT 4: Electrical & Electronics.</p> <p>UNIT 5: Carpentry.</p> <p>UNIT 6: Plastic moulding, glass cutting.</p> <p>UNIT 7: Metal casting.</p> <p>UNIT 8: Welding (arc welding & gas welding), brazing.</p> <p>Practicals:</p> <ol style="list-style-type: none"> 1. Machine shop 2. Fitting shop 3. Carpentry 4. Electrical & Electronics 5. Welding shop (Arc welding + Gas welding) 6. Casting 7. Smithy 8. Plastic moulding & Glass Cutting 					
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai. 2. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002. <p>REFERENCES BOOKS:</p> <ol style="list-style-type: none"> 1. Gowri P. Hariharan and A. Suresh Babu,” Manufacturing Technology – I” Pearson Education, 2008. 2. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India,1998. 3. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGraw Hill House, 2017. 					

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH206	Sports and Yoga	0	2		
<p>UNIT 1: INTRODUCTION TO PHYSICAL EDUCATION Meaning & definition of Physical Education; Aims & Objectives of Physical Education; Changing trends in Physical Education</p> <p>UNIT 2: OLYMPIC MOVEMENT Ancient & Modern Olympics (Summer & Winter); Olympic Symbols, Ideals, Objectives & Values; Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)</p> <p>UNIT 3: PHYSICAL FITNESS, WELLNESS & LIFESTYLE Meaning & Importance of Physical Fitness & Wellness; Components of Physical fitness; Components of Health related fitness; Components of wellness; Preventing Health Threats through Lifestyle Change; Concept of Positive Lifestyle</p> <p>UNIT 4: FUNDAMENTALS OF ANATOMY & PHYSIOLOGY IN PHYSICAL EDUCATION, SPORTS AND YOGA Define Anatomy, Physiology & Its Importance; Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)</p> <p>UNIT 5: KINESIOLOGY, BIOMECHANICS & SPORTS Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports; Newton's Law of Motion & its application in sports; Friction and its effects in Sports.</p> <p>UNIT 6: POSTURES Meaning and Concept of Postures; Causes of Bad Posture; Advantages & disadvantages of weight training; Concept & advantages of Correct Posture; Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis. o Corrective Measures for Postural Deformities</p> <p>UNIT 7: YOGA Meaning & Importance of Yoga; Elements of Yoga; Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas; Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana); Relaxation Techniques for improving concentration - Yog-nidra</p> <p>UNIT 8: Yoga & Lifestyle Asanas as preventive measures; Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana; Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana; Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana; Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana; Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.</p> <p>UNIT 9: TRAINING AND PLANNING IN SPORTS Meaning of Training; Warming up and limbering down; Skill, Technique & Style; Meaning and Objectives of Planning; Tournament – Knock-Out, League/Round Robin & Combination.</p> <p>UNIT 10: PSYCHOLOGY & SPORTS Definition & Importance of Psychology in Physical Edu. & Sports Define & Differentiate Between Growth & Development; Adolescent Problems & Their Management o Emotion: Concept, Type & Controlling of emotions; Meaning, Concept & Types of Aggressions in Sports; Psychological benefits of exercise; Anxiety & Fear and its effects on Sports</p>					

Performance; Motivation, its type & techniques; Understanding Stress & Coping Strategies.

UNIT 11: DOPING

Meaning and Concept of Doping; Prohibited Substances & Methods; Side Effects of Prohibited Substances

UNIT 12: SPORTS MEDICINE

First Aid – Definition, Aims & Objectives; Sports injuries: Classification, Causes & Prevention; Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

UNIT 13: SPORTS / GAMES

Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.; History of the Game/Sport; Latest General Rules of the Game/Sport; Specifications of Play Fields and Related Sports Equipment; Important Tournaments and Venues; Sports Personalities; Proper Sports Gear and its Importance.

TEXT BOOKS:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga By B.K.S. Iyengar.

REFERENCES BOOKS:

1. Health and Physical Education – NCERT (11th and 12th Classes)

Subject Code	Course name	Credits	Lectures	Tutorials	Practical
BSH207	Universal Human values-II: Understanding Harmony and Ethical Human Conduct	3	2	1	

UNIT 1: INTRODUCTION TO VALUE EDUCATION

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations,

UNIT 2: HARMONY IN THE HUMAN BEING

Understanding Human being as the Co-existence of the Self and the Body Distinguishing between the Needs of the Self and the Body The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body , Programme to ensure self-regulation and Health

UNIT 3 – HARMONY IN THE FAMILY AND SOCIETY

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship', Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order

UNIT 4 – HARMONY IN THE NATURE/EXISTENCE

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

UNIT 5 – IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHICS

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

TEXTBOOKS/REFERENCES:

1. The Textbook - A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53
3. Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.

REFERENCES BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
2. The Story of Stuff (Book).
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
4. Small is Beautiful - E. F Schumacher.
5. Slow is Beautiful - Cecile Andrews
6. Economy of Permanence - J C Kumarappa
7. Bharat Mein Angreji Raj – Pandit Sunderlal
8. Rediscovering India - by Dharampal
9. . Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
10. . India Wins Freedom - Maulana Abdul Kalam Azad
11. Vivekananda - Romain Rolland (English)
12. Gandhi - Romain Rolland (English)