Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

Government Aided Autonomous Institute under Mumbai University

Andheri (W), Mumbai - 400058

COURSE CONTENTS

Semester I

F. Y. B.Tech. (CIVIL /MECHANICAL /ELECTRICAL) ENGINEERING

Academic Year: 2020-2021

List of Courses

Engineering Mathematics-I

Course Code	Course Name
BS-BT101	Engineering Mathematics-I

Course pre-requisites	Std. XI, XII Mathematics

Course Objectives
The objectives of this course are 1. To Introduce Differential Calculus. 2. To Introduce Partial Differentiations and its applications to find Maxima and Minima, Jacobian. 3. To Introduce Complex Numbers and its applications to find roots of equations. 4. To Introduce Vector Calculus.
Course Outcomes
Upon successful completion of the course, students should be able 1. Find n^{th} order derivative and expansions of functions. 2. Find partial derivatives of functions of more than one variable. 3. Find roots of algebraic equations and logarithm of complex numbers. 4. Find angle between two surfaces.
Course Content

Module No.	Details	Hrs.
1	**Differential Calculus** Successive differentiations, n^{th}-derivative of Exponential, Trigonometric & Algebraic functions. Leibnitz's theorem (without proof) and related examples.	05
2	**Expansions** of functions, Taylor's series, Maclaurin's series and examples. Indeterminate forms $\frac{0}{0}, \frac{\infty}{\infty}, 0 \times \infty, \infty - \infty, 1^{\infty}, \infty^{\infty}, 0^{0}$ Evaluation of limits using L' Hospital rule, Evaluation of limits using expansions of functions.	08
3	**Partial Differentiations** Partial differentiation, Partial derivatives of first and higher order, Total Differentiation, Differentiation of Composite & Implicit functions. Homogeneous Functions, Euler's Theorem on Homogeneous function with two & three independent variables (with proof), Deductions from Euler's Theorem.	08
4	**Maxima & Minima** of a function of two independent variables.	03

5	**Complex Numbers** Complex Numbers. Cartesian, Polar and exponential form of complex numbers. De- Moivre's Theorem. Expansion of $\sin(n\theta)$, $\cos(n\theta)$ in terms of powers of $\sin\theta$ and $\cos\theta$. Expansion of $\sin^n\theta$, $\cos^n\theta$ in terms of $\sin(n\theta)$, $\cos(n\theta)$.	06
6	**Circular and Hyperbolic functions.** Inverse Circular and Inverse Hyperbolic functions. Logarithmic functions, Roots of complex numbers.	06
7	**Vector differentiation** Scalar and vector point functions Gradient, Divergence and Curl, Solenoidal and Irrotational Vector Field. Directional Derivative, Angle between two surfaces.	06
Term Work		

Term work shall comprise of
1. One tutorial on each module totalling seven.
2. Two quiz or surprise test.

Text Books

Text Books: -
1. Shanti Narayan (2005), "Differential Calculus", S.Chand Publications,30th Edition, ISBN 8121904714, 572 Pages
2. B S Grewal (2014), "Higher Engineering Mathematics", Khanna Publications, 43rd Edition, ISBN 8174091955, 1315 Pages

Reference Books

Online Resource: SEAM Mobile Application, Google Play Store

Reference Books: -
1. Erwin Kreyszig (2010), "Advanced Engineering Mathematics" Wiley Eastern Limited, Singapore 10th edition, ISBN 8126554231, 1148 Pages.

Sr. No.	Examination	Module
1	T-I	1, 2
2	T-II	3, 4
3	End Sem	1 to 7

Basic Electrical Engineering

Course Code	Course Name
ES-BT102	Basic Electrical Engineering

Course pre-requisites	Standard XII Physics.

Course Objectives
The objectives of this course are 　1. Introduction to electrical circuits and its analysis. 　2. Introduction to single phase transformers and motors (DC and Induction). 　3. Discuss various laws/ theorems to compute voltages and currents in DC circuits. 　4. Introduce AC circuit analysis. 　5. Introduce construction and working principle of single-phase transformers and Motors (DC and Induction). 　6. Discuss three phase circuits for balanced load

Course Outcomes
Upon successful completion of the course, students should be able 　1. Analyze DC circuits. 　2. Analyze single and three phase AC circuits. 　3. Understand single phase transformer and Motors (DC and Induction).

Course Content		
Module No.	Details	Hrs.
1	DC Networks Kirchhoff's laws, node voltage and mesh current methods; Delta-star and star-delta conversion; Classification of Network Elements, Superposition principle, Thevenin's and Norton's theorems, Maximum Power Transfer theorem.	06
2	A.C. Circuits: A.C. through resistance, inductance and capacitance, R-L, R-C, R-LC series and parallel circuits, phasor diagrams, power and power factor. Problems by analytical as well as graphical methods.	06
3	Single Phase Transformer: Construction, working principal, Emf equation, Ideal and practical transformer, phasor diagrams, Equivalent circuit, O.C. and S.C. test, efficiency and regulation, All day efficiency.	04
4	Electrical Motors (No numerical expected): D.C. Motors: construction, working principal, Characteristics, emf equation, A.C. Motors: Rotating magnetic field theory, 3-φ Induction Motor. Single phase induction motor: Construction, working	06

	principal, double field revolving theory, split phase and capacitor start motors.	
5	Three Phase Circuits: Three phase voltage and current generation, star and delta connections (Balanced load), Relationship between phase and line current and voltages, phasor diagrams, Measurement of power by two wattmeter method Problems by analytical as well as graphical methods.	06
	TOTAL	**28**

Text Books
1. Joseph A. Edminster (1965), 'Electrical Circuits', TataMcGraw Hill, New Delhi, 4 th Edition, ISBN 0070189749.
2. Mittle and Mittle (2005), 'Basic Electrical Engineering',Tata McGraw Hill.
3. B.L.Theraja-'A Text Book of Electrical Technology',Vol-1, S. chand & co. NewDelhi,1st Edition (re Print), ISBN-81-219-2440-5.
4. V.K.Mehta –'Basic Electrical Engg. & electronics ', S. Chand & co. New-Delhi, 5th Edition, ISBN-81-219-0871-X, 903 pages.
Reference Books
1. H. Cotton (2011), 'Advanced Electrical Technology', Wheeler Publication, Alahabad, ISBN 8190630717, 1293 Pages.
2. Vincent Deltoro (1986), 'Electrical Engineering fundamentals', Pearson Education 2 nd Edition New Delhi, ISBN 0132471310, 896 Pages.

Sr.No.	Examination	Module
1	T-I	1, part of 2
2	T-II	Part of 2,3,4
3	End Sem	1 to 5

Engineering Graphics

Course Code	Course Name
ES-BT103	Engineering Graphics

Course pre-requisites	Standard XII Physics and Mathematics

Course Objectives
1. To understand the fundamental principles of solid geometry 2. To understand the concepts of projections of 2D & 3D object. 3. To solve Engineering Graphics problems using Sketchbook & any CAD software 4. Develop skills in reading & interpretation (visualization) of Engineering Drawings 5. To develop competence in use of CAD as an effective tool for Engineering Graphics

Course Outcomes
Upon successful completion of the course, students should be able 1. Draw & solve the problems on curves, lines, planes, solids 2. Identify the various geometries. 3. Differentiate line, planes, solids etc. 4. Practice & interpret the drawing of orthographic, isometric, missing views using any CAD software

Course Content		
Module No.	*Details*	*Hrs.*
1	Engineering Curves: Conics-Parabola, Ellipse, and Hyperbola. Involutes, Cycloidal Curves: Cycloid, Epicycloid, Hypocycloid. Spirals, Helix etc.	5
2	Projection of points & lines inclined to both the reference planes. Traces of the Lines on the Reference Planes.	4
3	Projection of Planes inclined to both the Reference Planes	3
4	Projection of Right regular Solids: Regular Polyhedrons (Tetrahedron), Prisms, Pyramids, Cylinders, Cones inclined to both the Reference Planes.	4
5	Orthographic Projections, Missing views, Isometric Projections using Natural Scale, four center method, method of points, typical practical problems	8

Text Books
1. N.D.Bhatt (2011), 'Elementary Engineering Drawing',Charotar Publishing House, ISBN9380358172, 728 Pages 2. T.Jeyapovan (2010), 'Engineering Drawing and Graphics, Vikas Publishing House Pvt. Ltd. 3 Rd Edition, ISBN 8125940006, 712 Pages

3. K.L. Narayana&P.Kannaiah (1988), 'Engineering Graphics', Tata McGraw-Hill Co .Ltd., New Delhi, ISBN 0074517902, 544 Pages

Reference Books

1. K.Venugopal (2007), 'Engineering Drawing and Graphics', New Age International Publishers, ISBN 8122415458, 410 Pages
2. Giesecke, Mitchell, Spencer &Hill (2011), 'Technical Drawing', Macmillan Publishing Co. Inc.14th Edition, ISBN 0135090490, 936 Pages
3. Warren H. Luzadder (1976) , 'Fundamentals of Engineering Drawing', Prentice Hall of India Pvt.Ltd., New Delhi 7th Edition, ISBN 0133383687, 620 Pages
4. M.B.Shah&B.C.Rana (2009), 'Engineering Drawing', Pearson Education 2nd Edition, ISBN 8131710564, 580 Pages
5. M.L. Dabhade (2004), 'Engineering Graphics', Association of Technical Authors, ISBN 8187575751, 772 Pages

Sr. No.	Examination	Module
1	T-I	1, & Part of module 2
2	T-II	3 & Part of module 4
3	End Sem	1 to 5

Engineering Mechanics-I

Course Code	Course Name
ES-BT104	Engineering Mechanics-I

Course pre-requisites	Standard XII Physics

Course Objectives
The objectives of this course are: 1. To introduce the students to the principles and methods of statics (mechanics), and to apply those fundamentals to solve the problems on statics. 2. To prepare the base for the students to study other engineering/structural engineering courses.

Course Outcomes
Upon successful completion of the course, students shall be able to develop analytical skills: to 1. To determine the resultant of coplanar system of forces. 2. To solve the problems involving equilibrium of coplanar system of forces. 3. To analyse statically determinate pin jointed frames. 4. To analyse determinate beams using the principle of virtual work.

Course Content		
Module No.	Details	Hrs.
1	**System of Coplanar forces:** Introduction to coplanar & non-coplanar force system. Forces and their components. Moment of the force about a point, couple. **Resultant of coplanar force system:** Resultant of concurrent forces, parallel forces, non-concurrent non-parallel system of forces. Varignon's theorem.	07
2	**Equilibrium of coplanar force system:** Meaning of equilibrium, free body diagrams, equilibrium of concurrent, parallel and non-concurrent non-parallel (general) system of forces. Types of supports, determination of reactions at supports for various types of determinate beams.	07
3	**Analysis of pin jointed frame / truss:** Perfect truss, Imperfect truss, Analysis of truss by method of joints and method of sections.	05
4	**Friction:** Laws of friction, angle of friction, angle of repose, cone of friction, Equilibrium of bodies on rough horizontal and inclined plane, application to problems involving wedges, ladder. Belt	05

	friction- flat belts on the flat pulleys (Only problems, no derivation of formula). **Self-Learning:** Derivation of formula for Belt friction- flat belts on the flat pulleys.	
5	**Principle of virtual work:** Application to determine the reactions of determinate beams with / without internal hinges.	04
	TOTAL	**28**

Text Books

1. R. C. Hibbeler (2007); "Engineering Mechanics", Pearson Education Inc., ISBN 0132215098, 656 pages.
2. K. Tayal (2010), 'Engineering Mechanics', Umesh Publication, ISBN 9380117388, 740 pages.
3. K. L. Kumar (1998), "Engineering Mechanics", Tata McGraw Hill, ISBN 0070681813, 673 pages.

Reference Books

1. B. N. Thadani (1966); "Engineering Mechanics", Asia Publishing House, ISBN 0210269405, 655 pages.
2. Beer & Johnson (2013), "Engineering Mechanics", Tata McGraw Hill, ISBN 1259062919, 470 pages.
3. F. L. Singer (1975), "Engineering Mechanics", Harper & Raw Publication, ISBN 0060462329, 724 pages.
4. Nelson (2009), "Engineering Mechanics", Tata McGraw Hill, ISBN 0070146143
5. Shames (2006), 'Engineering Mechanics', Prentice Hall, India, ISBN 8177581236, 837 pages.

Sr. No.	Examination	Module
1	T-I	1, 2
2	T-II	3, 4
3	End Sem	1 to 5

Applied physics I

Course Code	Course Name
BSBT105	Applied Physics I

Course pre-requisites	XII Physics, Mathematics of differential equations

Course Objectives
1. To explain particle related properties of waves and wave related properties of particles, introduce students to Quantum mechanics basic concepts. 2. To explain Schrodinger's time dependent and time independent equations and applications. 3. To analyse basic working principles of semiconductors and learn physics behind them. 4. To explore different crystal structures, crystal plane orientations in cubic structures, and determine crystal properties using X-rays.

Course Outcomes
Upon successful completion of the course, students should be able: 1. Learn basic differences between Newtonian mechanics and Quantum mechanics, analyse particle properties of waves and wave nature of particles from different experiments, concept of wave function and analyse Heisenberg's uncertainty principle with the aid of examples. 2. Learn Schrodinger's time dependent and time independent equations and applications of these equations. 3. Explain types of crystal structures using unit cell properties and crystal planes in cubic structures and learn the application of X-rays for determining these crystal structures and crystal planes. 4. Differentiate between the types of solids based on their band structure and understand the physics behind working of semiconductors and Hall effect in semiconductors.

Course Content		
Module No.	*Details*	*Hrs.*
1	**Particle properties of waves** Black body radiation, Photoelectric effect, Compton effect, X-ray diffraction, types of X-rays, continuous and characteristic spectrum.	06
2	**Wave nature of particles** Wave particle duality, de Broglie wavelength; experimental verification of de Broglie theory; properties of matter waves; wave packet, group velocity and phase velocity; Wave function, Physical interpretation of wave function. Heisenberg's uncertainty principle; Electron diffraction	06

	experiment and Gama ray microscope experiment; Applications of uncertainty principle.	
3	**Quantum Mechanics:** Schrodinger's time dependent form, steady state form of Schrodinger's equation, Motion of free particle, Particle trapped in one dimensional infinite potential well.	08
4	**Introduction to solids:** Basic concepts: Seven basic types of crystal systems, lattice, basis, crystal axes, unit cells, lattice parameters, co-ordination number, atomic packing factor, void space. Crystal structures: SC, BCC, FCC, Diamond and NaCl. Crystal planes and directions: Miller indices, drawing of crystal planes and directions in a simple cubic unit cell, interplanar spacing between planes, important planes of SC, BCC and FCC structures. Bragg's X-ray spectrometer, Applications in crystallography.	05
5	**Band structure in solids**: Band formation in solids and classification based on band theory. Fermi-Dirac statistics, concept of Fermi level and its variation with temperature, impurity and applied voltage. Carrier concentrations: intrinsic and extrinsic, carrier drift mobility, resistivity and Hall effect, carrier diffusion, Einstein's relations, current density and continuity equations.	05

Text Books
1. Kshirsagar and Avadhanulu (1992), 'A textbook of Engineering Physics', S. Chand Publications, ISBN 8121908175,758 Pages.
2. A.S. Vasudeva (2008), 'Modern Engineering Physics', S. Chand Publications, ISBN 8121917573, 383 Pages.
3. Hitendra K Malik and AK Singh (2013), 'Engineering Physics', McGraw Hill Publications, ISBN 0070671532
4. G Vijayakumari (2006), 'Engineering Physics', Vikas Publishing house, ISBN 9788125924098, 425 Pages.

Reference Books
1. Arthur Beiser (2009), 'Concepts of Modern Physics', Tata McGraw Hill, 6th Edition, ISBN0070151555, 623 pages.
2. Robert Eisberg, Robert Resnick (2006), 'Quantum Physics of atoms, molecules, solids, nuclei and particles', Wiley India pvt. Ltd, 2nd Edition, ISBN 9788126508181

3. Arthur Beiser (2009), 'Concepts of Modern Physics', Tata McGraw Hill, 6th Edition, ISBN0070151555, 623 pages.

4. Robert Eisberg, Robert Resnick (2006), 'Quantum Physics of atoms, molecules, solids, nuclei and particles', Wiley India pvt. Ltd, 2nd Edition, ISBN 9788126508181

5. Charles Kittel (2004), 'Introduction to Solid State Physics', John Wiley & Sons, 8th Edition, ISBN 0471415268, 704 pages.

6. S.O. Pillai (2010), 'Solid State Physics', 6th Edition, New Age International Publishers, ISBN 9788122427264, 832 Pages.

7. Ashcroft and Mermin (2003), 1st edition, 'Solid state Physics', C'engage learning Publication, ISBN 9789814369893, 826 pages.

8. M. Ali Omar (1999), 'Elementary Solid-State Physics', Pearson Education Publication, 5th Edition, ISBN 8177583778, 669 Pages.

Sr. No.	Examination	Module
1	T-I	1, 2
2	T-II	3, 4
3	End Sem	1 to 5

Applied Chemistry-I

Course Code	Course Name
BS-BT-106	Applied Chemistry-I

Course pre-requisites	Std. XII Chemistry

Course Objectives
The objectives of this course are 1. To introduce the students to basic knowledge of chemistry of water and lubricants 2. To introduce the student with different material characterization technique 3. To introduce the student to theory, principles and mechanism of chemical processes. 4. To introduce the application of chemistry in engineering and technology
Course Outcomes
Upon successful completion of the course, students should be able 1. Analyse water quality and application of water for fuel production. 2. Able to characterize material with different techniques 3. Determine chemical behavior of different types of lubricants 4. Learn Nano material and its application
Course Content

Module No.	Details	Hrs.
1	**Water** Hardness of water, types of hardness, units of Hardness, determination of hardness by EDTA method and numerical problems. Internal treatment of hard water. External Treatment of hard water by i) lime soda method with equations in general & Numerical problems. ii) Zeolite or permutit process & numerical problems. iii) Ion exchange method. Desalination of BRACKISH WATER - Reverse osmosis Ultra filtration and it's industrial applications. Methods to determine extent of water pollution i) BOD. ii) COD Chemical Analysis of water with special reference to Total Dissolved Salts TDS Methods to control water pollution – activated sludge process for sewage treatment, flow sheet diagram for sewage treatment, water for energy and fuel production, electrolysis, hydrogen gas production	06
2	**Lubricants**	04

		Definition, classification, functions, characteristic properties of an ideal lubricant with special reference to flash point, fire point, cloud point, pour point, Acid Value, saponification value and numerical problems on acid value & saponification value, Polymer-based lubricant additives for friction reduction, wear protection, or viscosity improvement, Biodegradable Polymers as Lubricant Additives	
	3	**Analytical technique for materials evaluation and characterization**	06
		Atomic Force Microscopy (AFM, Auger Electron Spectroscopy (Auger). Energy Dispersive X-ray Fluorescence Spectroscopy, Fourier Transform-infrared Spectroscopy, Ultraviolet /Visible Spectroscopy, Thermal Methods/Thermogravimetric Analysis, Gas Chromatography / Mass Spectrometry, Ion Chromatography, Scanning Electron Microscopy, Thermal Analysis (DSC, TGA), X-ray Photoelectron Spectroscopy, Metallographic Study, Rockwell Hardness Testing, UV, Fluorescence and its applications in medicine. Mechanical Testers and Tribological Tools: Micro indentation, Hardness Testing, Nanoindentation Hardness Testing, Rockwell Hardness Testing, ISO, EN, ASTM standardisation.	
	4	**Intermolecular forces and potential energy surfaces**	04
		Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.	
	5	**Nano –Materials and their synthesis**	05
		Introduction to Nanomaterial synthesis, sonochemistry, Graphite, Fullerenes, Carbon Nanotubes, Nanowires, Nanocores, Haeckelites-structure & their electronic and mechanical properties, Applications of Nanomaterials in – i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics & related fields v) Mechanics, shock-absorber fluid, surface polishing fluid	
Text Books			
1. S. S. Dara&Dara (1986), 'Engineering Chemistry', S. Chand & Company Ltd, 12th Edition, ISBN 8121903599, 992 Pages			
2. O.P. Khanna (2010), 'Material Science for engineering students', DhanpatRai, Publications (p) Ltd., ISBN 8189928317, 1179 Pages			
3. University chemistry, by B. H. Mahan			
Reference Books			
1. P.C.Jain& Monica Jain (2004), 'Engineering Chemistry', DhanpatRai publishing company Pvt. Ltd, 15th Edition, ISBN 8187433175, 1288 Pages			

2. Emil Roduner (2006), 'Nano Scopic Materials', RSC Publishing, ISBN 0854048571, 285 Pages
3. VasantGowarikar (1986), 'Polymer science', New Age International Pvt Ltd, ISBN 0852263074, 505 Pages
4. Cotlon (1994), 'Basic Inorganic Chemistry', Wiley India, 3rd Edition, ISBN 0471505323, 856 Pages
5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
6. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
7. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

Sr.No.	Examination	Module
1	T-I	1
2	T-II	2,3
3	End Sem	1 to 5

Basic Electrical Lab

Course Code	Course Name
ES-BT152	Basic Electrical Lab

Course pre-requisites	Standard XII Physics

Course Objectives
1. Understand use of various network laws/ theorems.
2. Analyse AC circuits.
3. To perform experiments such as OC SC test, Load test on single phase transformer.

Course Outcomes
Upon successful completion of the course, the students will have
1. Ability to apply circuit theorems for DC circuit analysis.
2. Analyse AC circuits and determine different circuit parameters.
3. Perform tests on single phase transformer to find equivalent circuit and efficiency of transformer with load variation.

Demonstration Experiments:
Study of meters (Tachometer, voltmeter, ammeter, multi-meter, wattmeter etc.)

Experiments	*Details*
1	To analyse Mesh and Nodal circuits.
2	To verify Superposition Theorem for the given circuit.
3	To verify Thevenin's & Norton's Theorems for the given circuit.
4	To plot Graph between Power & Load using Maximum power transfer theorem.
5	To Determine Inductance & Internal Resistance of R-L circuits.
6	To Determine Capacitance of R-C circuits.
7	To plot Curves for Efficiency & Regulation by direct Loading of single-phase transformer.
8	To carry out O.C. and S.C. test on a single-phase transformer.
Reference Books	

1. Joseph A. Edminster (1965), 'Electrical Circuits', TataMcGraw Hill, New Delhi, 4 th Edition, ISBN 0070189749.
2. Vincent Deltoro (1986), 'Electrical Engineering fundamentals', Pearson Education 2 nd Edition New Delhi, ISBN 0132471310, 896 Pages
3. B.L.Theraja-'A Text Book of Electrical Technology',Vol-1, S. Chand & co. NewDelhi,1st Edition (re Print), ISBN-81-219-2440-5.
4 V.K.Mehta –'Basic Electrical Engg. & electronics ', S. Chand & co. New-Delhi, 5th Edition, ISBN-81-219-0871-X, 903 pages.

Engineering Graphics – I (Lab)

Course Code	Course Name
ES-BT153	Engineering Graphics – I (Lab)
Course pre-requisites	Elementary knowledge about Softwares

Course Objectives
1. To solve Engineering Graphics problems using any CAD software   2. To understand User Interfaces of CAD softwares   3. To learn & understand various commands provided in any CAD softwares   4. To use the learnt commands & other facilities to create 2D/3D drawings in any CAD software   5.To develop competence in use of CAD as an effective tool to solve problems of Engineering Graphics
Course Outcomes
Upon successful completion of the course, students should be able to   1. Use CAD tool to draw and modify basic 2-dimensional objects like Curves, line, plane with dimensions.   2. Read & Interpret the 3-dimensional Solids/objects and draw orthographic projections using CAD tool   3. Read & Interprets the Orthographic Projections and draw the isometric view using CAD tool   4. Read Orthographic Projections & draw the Missing view using CAD tool

	List of Practical
Module No.	*Details*
1	Introduction to any CAD Software & Basic Drawing and Editing Commands. Explode, layers, Dimensioning, Trim, Extend, Hatching, plotting and Printing etc
2	To solve, construct & dimension the problems of Engineering Curves like Ellipse, parabola, hyperbola, involute using CAD tool.
3	To solve, construct & dimension the problems of Engineering Curves like Cycloid, spiral, helix etc.
4	To solve, construct & dimension the problems of Projection of Lines & Traces of lines using CAD tool
5	To solve, construct & dimension the problems of Projection of Planes using CAD tool
6	To solve, construct & dimension the problems of Projection of Solids using CAD tool
7	To solve, construct & dimension the problems of Projection of Solids on Prism, Pyramid, Cone & Cylinder using CAD tool

8	To solve, construct & dimension the problems of Orthographic projections for Simple parts using CAD tool
9	To solve, construct & dimension the problems of Orthographic projections for Complex parts using CAD tool
10	To solve, construct & dimension the problems of Missing views using CAD tool.
11	To solve, construct the problems of Isometric projections for simple parts using CAD tool
12	To solve, construct the problems of Isometric projections for complex parts using CAD tool

Term Work

Term work shall comprise of
1. Submission of Sketchbook containing all solved problems in Classroom covered on all modules.
2. Printouts of CAD drawings consisting of 4 to 5 problems on each module
3. MCQ/Oral/Test on all modules together

Text Books

- N.D.Bhatt (2011), 'Elementary Engineering Drawing',Charotar Publishing House, ISBN9380358172, 728 Pages
- T.Jeyapovan (2010), 'Engineering Drawing and Graphics, Vikas Publishing House Pvt. Ltd. 3Rd Edition, ISBN 8125940006, 712 Pages
3. .K.L.Narayana&P.Kannaiah (1988), 'Engineering Graphics', Tata McGraw-Hill Co .Ltd., New Delhi, ISBN 0074517902, 544 Pages

Reference Books

1. K.Venugopal (2007), 'Engineering Drawing and Graphics', New Age International Publishers, ISBN 8122415458, 410 Pages
2. M.L.Dabhade (2004), 'Engineering Graphics', Association of Technical Authors, ISBN 8187575751, 772 Pages
3. Prof. Sham Tickoo (Purdue University) &GauravVerma, "(CAD Soft Technologies) : Auto CAD 2017 (For engineers and Designers)", Dreamtech Press NewDelhi.

Engineering Mechanics-I Lab

Course Code	Course Name
ES-BT154	Engineering Mechanics-I Lab

Course pre-requisites	Standard XII Physics

Course Objectives
The objectives of this course are: 1. To introduce the students to the experimental methods to verify the principles and methods of statics (mechanics).

Course Outcomes
Upon successful completion of the course, students shall be able to: 1. Develop collaborative skills to work in a team/group. 2. Experimentally verify the principles of statics (mechanics).

List of Experiments
1. To find reactions of simply supported beam (Parallel force system) 2. To verify polygon law of forces (Concurrent force system) 3. To verify Lami's theorem using simple jib crane 4. Equilibrium of non-concurrent non parallel force system 5. To verify moment equilibrium condition using bell crank lever 6. To determine coefficient of friction using friction plane 7. To determine coefficient of friction using angle of repose method

Applied Physics- I Lab

Course Code	Course Name
BSBT155	Applied Physics Lab I

Course pre-requisites	XII Physics, Applied Physics I (BSBT105) theory.

Course Objectives
To setup theory related laboratory experiments on crystallography, semiconductors, and ultrasonic waves

Course Outcomes
On completion of this course, students will be able to: 1. Explain unit cell properties of different crystal structures studied in the theory and identify different crystal plane orientations. 2. Calculate the velocity of sound in a given medium using ultrasonic interferometer. 3. Explain Hall effect in semiconductors. 4. Use a CRO to measure voltage and frequency of a given wave.

List of experiments (All five to be performed!)
1. Demonstration of unit cell properties of different cubic structures. 2. Demonstration of important plane orientations and planar atomic densities of cubic planes. 3. Hall effect in semiconductors and to identify p and n type semiconductors. 4. Ultrasonic interferometer- measuring velocity of ultrasonic waves in a given medium. 5. Demonstration of using CRO and Lissajous figures.

Applied Chemistry-I Lab

Course Code	Course Name
BS-BT-156	Applied Chemistry-I Lab

Course pre-requisites	Std. XII Chemistry

Course Objectives
The objectives of this course are 1. To introduce the students to basic knowledge of material chemistry 2. To correlate theory with experiment 3. Application of chemistry in engineering and technology

Course Outcomes
The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. Upon successful completion of the course, students should be able 1. Carryout hardness of water sample and able to remove by using suitable method 2. Synthesize a small drug molecule and analyse a salt sample 3. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc

List of experiments
1. To determine Total, Temporary & Permanent hardness of water sample 2. Removal of hardness of water by Ion-Exchange Column 3. To determine COD of an effluent sample 4. To determine Acid-Value of the given Lubricating Oil 5. To determine Saponification-Value of the given Lubricating Oil 6. To determine Flash-Point/Fire-Point of lubricating oil 7. To determine ion exchange Capacity of ion exchange resin 8. To prepare Nano-Oxide using combustion method 9. To determination of chloride content of water 10. To determine sulphur content in unknown sample

Workshop Practice – I

Course Code	Course Name
ESC-BT199	Workshop Practice – I

Course pre-requisites	Basic knowledge of carpentry, smithy, fitting, electrical wiring and welding.

Course Objectives
The objectives of this course are 1. To impart knowledge to students to develop their technical skill sets for creating entities from raw material. 2. To give "hands on" training and practice to students for use of various tools, devices, machines. 3. To develop ability of students to understand, plan and implement various processes and operations to be performed on the raw material to create object of desired shape and size. 4. To give exposure to inter disciplinary domains.

Course Outcomes
1. Know various tools, machines, devices used in engineering practice for creating objects from raw material. 2. Know various operations in basic engineering shops. 3. Know various safety precautions to be taken during the various basic engineering operations. 4. Interpret job drawings, plan and execute processes and operations to produce basic components from raw material.

Course Content		
Module No.	**Details**	**Hrs.**
01	Fitting (Compulsory): - • Use and settings of fitting hand tools for marking, chipping, cutting, filing, centre punching, hammering, drilling and tapping. Term work to include one job: - Male –female joint involving above operations.	18
02	Carpentry (Compulsory): - • Use and setting of carpentry hand tools like hacksaws, jackplanes, chisels and gauges for construction of various joints. Term work to include one job involving a use of tools and operations: - Half Check joint.	18

03	Forging / Smithy (Demonstration): - • Term work to include one job: - Lifting Hook and Handle to be demonstrated by instructor to batch in group of 4-5 students.	09
04	Welding (Demonstration): - • Edge preparation for welding jobs, arc welding, different types of joints such as Lap Welding, Butt Welding etc. Term work to include one job involving Lap welding and Butt welding of two plates to be demonstrated by instructor to a batch in group of 4 to 5 students.	09
05	Electrical Board Wiring (Demonstration): - • House wiring, staircase wiring for fluorescent tube light, go-down wiring and three phase wiring for electrical motors. Term work to include the demonstration of the electrical wiring as described above.	09
06	Carpentry (Demonstration): - • Wood turning Demonstration to be demonstrated by instructor to a batch in group of 4 to 5 students. Term work to include the report on demonstration of wood turning process.	09
07	Machine Shop (Demonstration): - • One turning job to be demonstrated by instructor to a batch in groups of 4 to 5 students on lathe machine. Term work to include one report on demonstration of the turning job.	09

Term Work
Term work shall comprise of
Every student has to perform one job from compulsory trade and attend demonstration in any two trades in each of semester I and II. The course contents of Basic Workshop Practice and term work to be done in Semester –I & II are given together. The jobs for practice and demonstration are designed with the work of the course spread over two semesters.

Text Books
1. W. A. J. Chapman, "*Workshop Technology- Part I, II and III*", Edward Arnold.
2. S K & A K Hajra Choudhary, "*Workshop Technology, Vol. I, II*", Media promotors and publishers pvt. Limited, 2007.
Reference Book
3. G. Boothroyd & W.A. Knight, "Fundamental of Machining and Machine Tools, third edition", CRC.

COURSE CONTENTS

Semester II

F. Y. B.Tech. (CIVIL /MECHANICAL /ELECTRICAL) ENGINEERING Academic Year: 2020-2021

Engineering Mathematics-II

Course Code	Course Name
BS-BT201	Engineering Mathematics-II

Course pre-requisites	Std. XI, XII Mathematics, Engineering Mathematics-I

Course Objectives

The objectives of this course are
   1. To Introduce Ordinary Differential Equations
   2. To Introduce Gamma and Beta functions.
   3. To Introduce Curve tracing and Rectification of curves.
   4. To Introduce Multiple Integrals.

Course Outcomes

Upon successful completion of the course, students should be able
   1. Classify and solve differential equations in terms of ordinary/partial, Order, Exact, Linear.
   2. Find the general solution of linear higher order linear differential equation with constant coefficients.
   3. Evaluate integrals using Gamma functions, Beta functions.
   4. Evaluate multiple integrals and apply them to find area, mass and volume.

Course Content		
Module No.	**Details**	**Hrs.**
1	**First Order and First Degree Ordinary Differential Equations** Exact differential equations, Differential Equations which are reducible to the exact form by using integrating factors. First order linear differential equations and differential equations reducible to the linear form.	06
2	**Higher Order Linear Differential Equations** Higher Order Linear differential equations with constant coefficients. Complimentary Functions, Particular Integrals of differential equations of the type $F(D)y = Q(x)$. Cauchy's homogenous linear differential equations and Legendre's differential equations.	07
3	**Applications of Differential Equations, Gamma and Beta functions** Simple applications of differential equations of first and second order to Engineering problems. Gamma function, reduction formula.	09

	Beta function. Duplication formula, Relation between Gamma and Beta Functions and examples.	
4	**Rectification** Curve tracing in Cartesian and Polar Coordinates. Rectification of plane curves.	04
5	**Double Integrals** Introduction to Double Integrals, Change of order of double integral. Evaluation of double integral by changing to polar cord.	07
6	**Triple Integrals** Introduction to Triple Integrals, Evaluation of Triple Integrals using Cartesian, Cylindrical and Spherical polar coordinates.	05
7	**Applications of Multiple Integrals** Applications double integrals to find area and mass of lamina Applications of Triple Integrals to find volume.	04
Term Work		

Term work shall comprise of

1. One tutorial on each module totaling seven.
2. Two quiz or surprise test.

Text Books

Text Books: -

1. Richard Bronson (2010), " Schaum's Outline of Differential Equations", McGraw Hill Education; 4th edition ISBN 978-0071824859, 408 pages
2. Shanti Narayan (2005), "Integral Calculus", S.Chand Publications,35th Edition, ISBN 8121906814, 360 Pages
3. B S Grewal (2014), "Higher Engineering Mathematics", Khanna Publications, 43rd Edition, ISBN 8174091955, 1315 Pages
4. Vinod Kumar Sharma "Applied Mathematics-II" 2nd edition Tech Max Publications**.**

Reference Books

Reference Books: -

1. Erwin Kreyszig (2010), "Advanced Engineering Mathematics" Wiley Eastern Limited, Singapore 10th edition, ISBN 8126554231, 1148 Pages.
2. George Simmons (2002), "Differential Equations with Applications and Historical Notes" McGraw Hill Education; 2nd edition, ISBN 978-0070530713, 656 pages

Sr. No.	**Examination**	**Module**
1	T-I	1, 2
2	T-II	3, 4
3	End Sem	1 to 7

Basic Electronics Engineering

Course Code	Course Name
ES-BT202	Basic Electronics Engineering

Course pre-requisites	Std. XII Physics

Course Objectives
Course Objectives:

1. Discuss Electronics Devices Diodes, BJT, FET and their applications
2. Introduce Operational amplifier and its applications as an amplifier, adder, subtractor and voltage follower.
3. Introduce, Gates, Boolean Algebra and logic simplification.

Course Outcomes
Upon successful completion of the course, students should be able

1. Understand the characteristics of electronic devices like Diode, BJT and FET.
2. Appreciate use diodes in rectifiers and filters.
3. Design Operational amplifier applications.
4. Apply Boolean algebra and implement digital circuits using basic gates.

Course Content		
Module No.	*Details*	*Hrs.*
1	Diode Applications: Half wave, Full wave, Bridge Rectifiers, Specifications of the devices required for C, LC, and CLC filter, Zener as a regulator.	08
2	BJT configurations such as CE, CC, CB, Characteristics, BJT as a switch, BJT as an amplifier.	06
3	Field Effect Transistors FET: JFET construction, characteristics (CS), FET as an amplifier.	05
4	Op amp as a basic block. Op amp as a inverting and non inverting Amplifier. Applications like adder, subtractor, voltage follower, etc.	05
5	Digital Electronics Fundamentals: Difference between analog & digital signals, Basic & Universal Gates, Boolean algebra, Truth tables, Expressions, Logic simplification.	04
	TOTAL	**28**

Text Books
1. Jain R.P. (2003), 'Modern Digital Electronics', Tata McGraw Hill, I

SBN0070494924, 611 pages.
2. Bhargava, Kulshreshtha, Gupta (1984), 'Basic Electronics and Linear Circuits', TTTI Chandigarh, TMH, ISBN 0074519654, 490 Pages
3. V.K.Mehta –'Basic Electrical and Electronics Engineering', S. Chand & co. New-Delhi,5th Edition, ISBN-81-219-0871-X, 903 pages.

Reference Books

1. Robert Boylestad and Louis Nashelsky (2009), 'Electronic devices and circuits', Prentice Hall of India 10th Edition, ISBN 0135026490, 894 Pages.
2. Mottershed Allen (1973), 'Electronic Devices and Circuits an Introduction', Prentice Hall of India, 1st Edition, ISBN 8120301245, 656 Pages.
3. Malvino and Leach, "Digital Principal and Application", Tata McGraw Hill, sixth Edition, 2006.
4. Bignell James and Donovan Robert," Digital Electronics", Delmar, Thomas Learning2001.
5. Gayakwad Ramakant," Op-Amps and Linear Integrated Circuits", 4th Edition, PHI Publication.

Sr.No.	Examination	Module
1	T-I	1
2	T-II	2, part of 3
3	End Sem	1 to 5

Engineering Mechanics-II

Course Code	Course Name
ES-BT204	Engineering Mechanics-II

Course pre-requisites	Standard XII Physics, ES-BT104, ES-BT154

Course Objectives
The objectives of this course are 1. To introduce the students to the principles and methods of dynamics (mechanics), and to apply those fundamentals to solve the problems on dynamics. 2. To prepare the base for the students to study other engineering/structural engineering courses at a later stage.

Course Outcomes
Upon successful completion of the course, students shall be able to develop analytical skills: 1. To find the centroid and moment of inertia of plane areas. 2. To solve the problems on kinematics of particles. 3. To solve the problems on kinetics of particles and kinetics of rigid bodies.

Course Content		
Module No.	**Details**	**Hrs.**
1	**Centroid of Plane Areas:** Concept of centroid of plane areas. Problems on centroid of composite areas.	03
2	**Moment of Inertia:** Moment of inertia of plane areas, parallel axis theorem. Introduction to polar moment of inertia, product of inertia and mass moment of inertia. Problems on moment of inertia of composite areas.	03
3	**Kinematics of particle:** Velocity and acceleration in terms of rectangular coordinate system, rectilinear motion, motion along plane curved path, tangential and normal component of acceleration, relative velocity, and projectile motion. (No derivations of formulas).	08
4	**Kinetics of particles:** Newton's laws of motion, D'Alembert's principle, equation of dynamic equilibrium, linear motion, curvilinear motion.	03
	Energy principles: Work done by a force, potential and kinetic energy, power, work energy equation, principle of conservation of energy.	04

5	**Momentum principles:** Momentum, impulse and momentum principle, principle of conservation of momentum, impact of solid bodies, elastic impact, semi-elastic impact and plastic impact.	05
	Kinetics of rigid bodies: D'Alembert's principle for bodies under rotational motion about a fixed axis.	02
	TOTAL	**28**

Text Books

1. R.C.Hibbeler (2007);"Engineering Mechanics", Pearson Education Inc., ISBN 0132215098, 656 pages.
2. A. K. Tayal (2010), 'Engineering Mechanics', Umesh Publication, ISBN 9380117388, 740 pages.
3. K. L. Kumar (1998), "Engineering Mechanics", Tata McGraw Hill, ISBN 0070681813, 673 pages.

Reference Books

1. B. N. Thadani (1966); "Engineering Mechanics", Asia Publishing House, ISBN 0210269405, 655 pages.
2. Beer & Johnson (2013), "Engineering Mechanics", Tata McGraw Hill, ISBN 1259062919, 470 pages.
3. F. L. Singer (1975), "Engineering Mechanics", Harper & Raw Publication, ISBN 0060462329, 724 pages.
4. Shames (2006), 'Engineering Mechanics', Prentice Hall, India, ISBN 8177581236, 837 pages.

Sr. No.	Examination	Module
1	T-I	1, 2
2	T-II	3, 4
3	End Sem	1 to 5

Applied Physics - II

Course Code	Course Name
BSBT205	Applied Physics II

Course pre-requisites	XII Physics, Mathematics of vector calculus.

Course Objectives
1. To understand differential operator Del, theory of static electric and magnetic fields using principles of divergence and curls. 2. To learn Maxwell's equations and how he incorporated corrections in certain equations and Electromagnetic waves in vacuum. 3. To explain and interpret basic properties involved in thin film interference and diffraction. 4. To explain working principles of LASERs.
Course Outcomes
Upon successful completion of the course, students should be able to: 1. Explain concepts of gradient, divergence, curls and to explain Gauss' law and Ampere's law in integral and differential form and the comparison between Electrostatic and magnetostatic fields. 2. Analyse electromagnetism before and after Maxwell, electromagnetic wave equations, explain concepts of Poynting vector and energy and momentum carried by electromagnetic waves. 3. Analyse thin film interference pattern using the concepts of wedge-shaped fringes and Newton's rings and analyse Fraunhofer diffraction using single, double slits and a diffraction grating. 4. Explain different absorption and emission processes, population inversion condition and pumping schemes which differentiate LASERs from normal light sources and explain working of certain LASERs using these concepts and futher explain application of LASERs in holography.

Course Content		
Module No.	Details	Hrs.
1	**Basic vector calculus and Electrostatics:** Concept of gradient, divergence and curl. Fundamental theorems: of calculus, for gradients, for divergences and for curls. Coulomb's law, Gauss' law, divergence and curl of electrostatic fields, introduction to scalar potential, relation of potential with field.	06
2	**Magnetostatics** Divergence and curl of B, BiotSavart law, magnetic vector potential. Comparison of Electrostatics and magnetostatics.	04
3	**Electromagnetism and electromagnetic waves**	10

		Electrodynamics before Maxwell, Maxwell's equations, Maxwell's equations in matter. The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples, Poynting vector, Momentum carried by electromagnetic waves.	
	4	**Optics** Interference in thin films- equal thickness and wedge-shaped films, Newton's rings. Applications. Types of diffraction, Fraunhofer diffraction through a single slit and diffraction grating, grating spectra, resolving power and dispersive power of a grating.	05
	5	**LASERs** Absorption, spontaneous and stimulated emission, Einstein's coefficients. Terms Associated with Lasers: population inversion, metastable state, pumping and pumping schemes, active medium, and resonant cavity. Ruby laser, He-Ne Laser, Nd:YAG laser. Holography using LASERs.	05

Text Books
1. Kshirsagar and Avadhanulu (1992), 'A textbook of Engineering Physics', S. Chand Publications, ISBN 8121908175,758 Pages.
2. A.S. Vasudeva (2008), 'Modern Engineering Physics', S. Chand Publications, ISBN 8121917573, 383 Pages.
3. Hitendra K Malik and AK Singh (2013), 'Engineering Physics', McGraw Hill Publications, ISBN 0070671532
4. G Vijayakumari (2006), 'Engineering Physics', Vikas Publishing house, ISBN 9788125924098, 425 Pages.
Reference Books
1. David J. Griffiths (2012), 'Introduction to Electrodynamics', PHI Publications, 4thEdition, ISBN 8120347765.
2. K. Thyagarajan and AjoyGhatak (2006), 'Lasers theories and application'Springer, 2nd Edition, ISBN1441964410, 650 pages. 5th Edition, ISBN 8177583778, 669 Pages.

Sr. No.	Examination	Module
1	T-I	1, 2
2	T-II	3, 4
3	End Sem	1 to 5

Applied Chemistry-II

Course Code	Course Name
BS-BT-206	Applied Chemistry-II

Course pre-requisites	Std. XII Chemistry

Course Objectives

The objectives of this course are
  1. To introduce the students to basic knowledge of alloy, fuel, green chemistry, corrosion and its protection
  2. To introduce the student to theory, principles and mechanism of chemical processes
  3. To introduce the application of chemistry in engineering and technology.

Course Outcomes

Upon successful completion of the course, students should be able
  1. Analyse process of corrosion and its protection methods
  2. Determine fuel characteristics, properties and their application
  3. Implement use of green chemistry
  4. Able to identify high performance materials

Course Content

Module No.	Details	Hrs.
1	**Corrosion and surface chemistry** Voltaic Cells / Galvanic Cells, Electrolytic Cells, Reversible Cells, Definition, Types of corrosion-Dry or Chemical Corrosion, Wet or Electrochemical corrosion, Bi-metallic corrosion, Concentration cell corrosion-differential Aeration corrosion, Pitting Corrosion, Water Line Corrosion, stress Corrosion, Inter-granular Corrosion. Polarization, over voltage, Passivity, Factors affecting rate of corrosion. Electrochemical & Galvanic series, Protection from Corrosion: Cathodic and Anodic Protection, Cathodic and Anodic coatings, Galvanising & Tinning, Metal Cladding, Electroplating. Corrosion in electronic devices and photonic devices.	06
2	**Fuel** Calorific Value-Gross and Net Calorific Value, Conversion & numerical problems. Proximate and Ultimate Analysis of Fuels, numerical problems. Combustion-Calculations for given Solid, Liquid, Gaseous Fuel Biodiesel-Methods to obtain Biodiesel. Cracking, Knocking, Octane Value of Petrol, Cetane Value of Diesel, Anti-Knocking Agents. Recent technologies for catalytic converter.	06

	Fuel cells and photovoltaic cells, types of fuel, proton exchange membrane, polymer electrolyte, solid oxide fuel cells	
3	**High Performance Polymers and Materials** High-Performance Polymers for Engineering-Based Composites, New Smart Materials via Metal Mediated Macromolecular Engineering, Materials for Biomedical Applications, Engineering Thermoplastics, Semiconducting polymers, Semiconducting Polymers Towards Device Applications, High performance materials, eg., Silicon nitride	04
4	**Organic Reactions and Synthesis of a Drug Molecule (4 Lectures)** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule. Electro-Organic Synthesis	04
5	**Green-Chemistry** Goal, Significance and 12-Principles of Green Chemistry with examples, Green Path Green-Reagents, SCFE, SCCO2,green propellant – ultra pure H_2O_2 . Industrial applications of Green-Chemistry. Numerical problems on percentage atom economy	04

Text Books

1. S. S. Dara&Dara (1986), 'Engineering Chemistry', S. Chand & Company Ltd, 12th Edition, ISBN 8121903599, 992 Pages
2. O.P. Khanna (2010), 'Material Science for engineering students', DhanpatRai, Publications (p) Ltd., ISBN 8189928317, 1179
3. University chemistry, by B. H. Mahan

Reference Books

1. P.C.Jain& Monica Jain (2004), 'Engineering Chemistry', DhanpatRai publishing company Pvt. Ltd, 15th Edition, ISBN 8187433175, 1288 Pages
2. Emil Roduner (2006), 'Nano Scopic Materials', RSC Publishing, ISBN 0854048571, 285 Pages
3. VasantGowarikar (1986), 'Polymer science', New Age International Pvt Ltd, ISBN 0852263074, 505 Pages
4. Cotlon (1994), 'Basic Inorganic Chemistry', Wiley India, 3rd Edition, ISBN 0471505323, 856 Pages
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Sr.No.	Examination	Module
1	T-I	1
2	T-II	2,3
3	End Sem	1 to 5

Computer Programming

Course Code	Course Name
ES-BT207	Computer Programming

Course pre-requisites	Basic Knowledge of computers

Course Objectives
The objectives of this course are 1. Master basic procedural programming constructs for decision and iteration. 2. Understand principles like decomposition, information hiding, and use of parameters and return values to create flexible components. 3. Understand major concept of object-oriented programming like encapsulation and inheritance
Course Outcomes
Upon successful completion of the course, students should be able 1. Remember Data types and apply basics of Control Structures to programming. 2. Design programs using functions, arrays, strings. 3. Understand and apply the knowledge of OOPS to write programs. 4. Apply debugging to already existing codes.
Course Content

Module No.	Details	Hrs.
1	**Basics of Programming:** Defining problem statement, solution development using Algorithmic approach. Basic concepts of computer structure and program execution.	01 01
2	**Basic Data Type:** Concept of Variables and constants, Data types, expressions, and assignment, Input / Output from console. **Control Structure:** Conditional execution – if/else, Switch, Break, Continue. Iteration – do-while, for, while.	02 03 03
3	**Functions:** Defining Functions- Procedural decomposition of problems, localizing variables, parameter passing– value and reference, return values. **Special Functions Concepts:** Recursive functions and function overloading.	04 03
4	**Arrays:** Arrays – one-dimensional, Multidimensional Strings	03 02

5	**Introduction to structures.** **Introduction to Object Oriented Programming:**	01
	Object Oriented Language concepts – classes, objects, Constructor and Destructors.	02
	Inheritance – Access specifiers, Types of Inheritance with examples.	03

Text Books
1. Balaguru Swami (2008),” Object Oriented Programming with C++”, Tata McGraw-Hill Publishing Company Ltd., 3 rd Edition, ISBN 0070669074, 624 Pages
2. Bjarne Stroustrup (2013),” The C++ Programming Language”, Addison Wesley Publishing Company, 4 th Edition, ISBN 0321563840, 1368 Pages.
Reference Books
1. Mahesh Bhave and Sunil Patekar (2012), “Object- Oriented Programming with C+ +, Pearson Education, 1st Edition, ISBN 8131798585, 688 Pages.
2. Robert Lafore (2001), “Object-Oriented Programming in C++”, Sams Publishing 4th Edition, ISBN 0672323087, 1040 Pages.

Sr. No.	Examination	Module
1	T-I	1, 2(partly)
2	T-II	2(remaining), 3, 4 (partly)
3	End Sem	1 to 5

Organizational Communication and Interpersonal Skills

Course Code	Course Name
HSM BT 208	Communication Skills

Course pre-requisites	Standard English XII

Course Objectives
The objectives of this course are 1. To identify the basics of grammar so as to help improve communication and speak a neutral and correct form of English. The focus is to assist the students entering the technical field to acquire proficiency in language and technical vocabulary. 2. To make the learners capable of understanding importance of communication and understand the verbal and non-verbal forms of communication so as to create an understanding of the barriers to communication and to overcome then in Social and Professional sphere. 3. To acquaint the students with different flows of communication in an organization and to make them proficient with the effective use of communication channels. 4. To guide and teach the students the appropriate language skills with the purpose of improving the existing LSRW, and make the student proficient in public speaking and presentation skills. 5. To make the learner capable of creating official correspondence through principles of business correspondence for effective communication in the global world

Course Outcomes
Upon successful completion of the course, students should be able 1. Understand and evaluate information they read, write and listen to and express their ideas with greater clarity in personal and professional life. 2. Speak and respond effectively along the various channels and forms of communication in an organization. 3. Students will inculcate effective listening, writing, reading and speaking skills and be equipped to express ideas in an effective manner and learn interpersonal skills. 4. Communicate through result-oriented writing both within and outside the organization. In real life situations, students can learn to effectively communicate in various social and professional situations, and develop new perspectives. 5. He or she can learn to participate and contribute to technical and non-technical discussions.

Course Content		
Module No.	*Details*	*Hrs.*
1	**Building advanced vocabulary:** Common errors, Pairs of confused words, Enriching vocabulary through Synonyms, antonyms, words through situations, one-word substitution, comprehending technical passages, journal papers, articles to test the analytical skills and expression.	03
2	**Fundamentals of Communication:** Meaning, Definitions, Components, Objectives, Importance of communication, Purpose of Professional Communication, Barriers to Communication (Cultural, Semantic, Psychological, physical, mechanical, organizational), Different Forms of Communication: Verbal, Non-Verbal, Intrapersonal, Interpersonal, Extra- Personal	10
3	**Communication Network in a Business Organization:** Different types of communication flow: Internal, External, Upward, Downward, Horizontal, Grapevine, Problems and Solutions. Video conferencing and Netiquettes	04
4	**Techniques to Improve Communication: Reading, Writing, Listening and Speaking:** Reading Skills – Barriers to Reading and Techniques to improve reading. Speaking Skills – Voice Modulation, Good Pronunciation, -Speaking without Fear, -Extempore & Prepared Speaking, role play in different situations. How to present effective speeches through Talk power Program. Listening Skills – Barriers to Listening, Listening & Note taking. Writing Skills – Barriers and Techniques to improve writing skills.	08
5	**Business Correspondence: (Letter Writing):** Introduction, Importance, Layout, Elements of style and Language, Principles of Business Correspondence, Types of	07

formats-3, Types of letters: Routine letters, Enquiry and Reply, Order, Complaint and Adjustments, Sales Letters.	

Term Work
1. 2 assignments on Summarization and Comprehension, One-word substitute
2. 3 practical session through public speaking, Speeches and Presentation
3. 3 assignments on Communication Theory, Communication in a business environment
4. 4 assignments on Business Correspondence.
5. Practical Assignments on Module 4 on Reading, Writing, Listening and Speaking.
6. Group Activity and role play
7. Language lab course for vocabulary. Language Alb sessions for Vocabulary building, and Grammar, Reading, Listening Skills.

Text Books:

1. Communication in Organizations, Dalmar Fisher, Jaico Publishing House, Edition2nd.
2. Business Communication: Connecting at work, Hory Shankar Mukherjee, Oxford University Press, 1st Edition
3. Communication Skills, Meenakshi Raman & Sangeeta Sharma, Oxford University Press, 1st Edition
4. Business Correspondence & Report-writing, R.C. Sharma & Krishna Mohan, Tata McGraw Hill, 2nd Edition.

Reference Books:

1. Effective Business Communication, Herta Murphy, Mc Graw Hill, 7th Edition
2. Business Communication- Building Critical Skills, Kitty O. Locker, Manjul Publications, 18th edition.
3. Non Verbal Communication: The Unspoken Dialogue, J.K Burgoon, D.B Buller and W.G Woodall, McGraw Hill, 3rd edition
4. Model Business Letters, Emails and Other Business Documents, Shirley Taylor, pearson, 7th edition
5. English Vocabulary in Use; Michael McCarthy and Felicity O'Dell; Cambridge University Press; 7th edition.

List of E-Books:

1. http://www.free-management-ebooks.com/dldebk-pdf/fme-effective-communication.pdf; Team FME; Free Management E-Books
2. https://msu.edu/course/be/485/bewritingguideV2.0.pdf; Faculty of MSU; Michigan State University
3. http://www.bizmove.com/books/how-to-improve-your-nonverbal-communications-skills.pdf; BizMove Management Training Institute

Applied Physics - II Lab

Course Code	Course Name
BS-BT255	Applied Physics

Course pre-requisites	XII Physics, Applied Physics II (BSBT205) theory.

Laboratory Objectives:
1. To setup theory related laboratory experiments on crystal physics and magnetism so as to apply his/her theoretical knowledge to a practical situation.
Laboratory Outcomes:
At the end of this course, students will be able to: 1. Explain the applications of thin film interference using Wedge shaped films experiment and Newton's Rings.   2. Explore the visible spectrum using a diffraction spectrometer and find the wavelength range.   3. Understand the use of Lasers and Optical fibers in the field of Physics and Engineering.   4. Explain Hysteresis phenomenon in ferromagnetic materials plotting hysteresis curve.

List of experiments conducted: (Any five to be performed)

1. Finding thickness of paper using wedge shaped films setup.
2. Finding radius of curvature of lens using Newton's rings setup.
3. Finding wavelength of different colours of mercury spectrum using principle of diffraction through a grating.
4. Finding grating element using diode lasers.
5. Hysteresis curve of a ferromagnetic material.
6. Photoelectric effect.

Applied Chemistry-II

Course Code	Course Name
BS-BT-256	Applied Chemistry-II Lab

Course pre-requisites	Std. XII Chemistry

Course Objectives
The objectives of this course are 1. To introduce the students to basic knowledge of material chemistry 2. To correlate theory with experiment 3. Application of chemistry in engineering and technology
Course Outcomes
Upon successful completion of the course, students should be able 1 Find out composition of metals in different alloy 2 Prepare and characterize new composite material 3 Prepare bio-diesel from edible oil
List of experiments
 1. List of Experiments: (Minimum 5 to be performed) 2. Estimation of Cu iodometrically 3. Estimation of Zn complexometric titration 4. Estimation of Ni complexometric titration 5. Estimation of Al complexometric titration 6. Calorific value of solid or liquid fuel using Bomb calorimeter 7. Thin layer chromatography 8. Determination of chloride content of water 9. Estimation of Sn iodometrically 10. Preparation of biodiesel from edible oil 11. Synthesis of simple layered materials and their characterization 12. Preparing simple composites and their characterization

Computer Programming Lab

Course Code	Course Name
ES-BT257	Computer Programming Lab

Course pre-requisites	Computer Programming

Course Objectives
The objectives of this course are 1. Write and debug small programs. 2. Manipulate various Data types and Apply basic programming concepts like loops, functions, arrays in programs. 3. Apply Object Oriented programming approach to various problem statements.
Course Outcomes
Upon successful completion of the course, students should be able 1. Construct programs using Control Structures. 2. Implement the use of functions and Arrays in C++ language. 3. Carry out programming using different features of OOPs.

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S. No.	Name of Experiment
1	To Write C-Programs Using Operators and Expressions
2	To Write C-Programs Using If-Else statement.
3	To Write C-Program Using While, Do-While loops.
4	To Write C-Program Using FOR loop.
5	To Write C-Program Using Functions.
6	To Write C-Program Using Special Functions
7	To Write C-Program Using Arrays.
8	To Write C-Program Using Strings.
9	To Write C-Program Using classes and objects.
10	To Write C-Program Using Inheritance
11	Mini projects incorporating all the above topics

Workshop Practice II

Course Code	Course Name
ESC-BT299	Workshop Practice – II

Course pre-requisites	Basic knowledge of carpentry, smithy, fitting, electrical wiring and welding.

Course Objectives
The objectives of this course are 1. To impart knowledge to students to develop their technical skill sets for creating entities from raw material. 2. To give "hands on" training and practice to students for use of various tools, devices, machines. 3. To develop ability of students to understand, plan and implement various processes and operations to be performed on the raw material to create object of desired shape and size. 4. To give exposure to inter disciplinary domains.

Course Outcomes
1. Know various tools, machines, devices used in engineering practice for creating objects from raw material. 2. Know various operations in basic engineering shops. 3. Know various safety precautions to be taken during the various basic engineering operations. 4. Interpret job drawings, plan and execute processes and operations to produce basic components from raw material.

Course Content		
Module No.	Details	Hrs.
01	Fitting (Compulsory): - Use and settings of fitting hand tools for marking, chipping, cutting, filing, center punching, hammering, drilling and tapping. Term work to include one job: - Male –female joint involving above operations.	18
02	Carpentry (Compulsory): - Use and setting of carpentry hand tools like hacksaws, jackplanes, chisels and gauges for construction of various joints. Term work to include one job involving a use of tools and operations: - Half Check joint.	18

03	Forging / Smithy (Demonstration): - • Term work to include one job: - Lifting Hook and Handle to be demonstrated by instructor to batch in group of 4-5 students.	09
04	Welding (Demonstration): - • Edge preparation for welding jobs, arc welding, different types of joints such as Lap Welding, Butt Welding etc. Term work to include one job involving Lap welding and Butt welding of two plates to be demonstrated by instructor to a batch in group of 4 to 5 students.	09
05	Electrical Board Wiring (Demonstration): - • House wiring, staircase wiring for fluorescent tube light, go-down wiring and three phase wiring for electrical motors. Term work to include the demonstration of the electrical wiring as described above.	09
06	Carpentry (Demonstration): - • Wood turning Demonstration to be demonstrated by instructor to a batch in group of 4 to 5 students. Term work to include the report on demonstration of wood turning process.	09
07	Machine Shop (Demonstration): - • One turning job to be demonstrated by instructor to a batch in groups of 4 to 5 students on lathe machine. Term work to include one report on demonstration of the turning job.	09
Term Work		
Term work shall comprise of Every student has to perform one job from compulsory trade and attend demonstration in any two trades in each of semester I and II. The course contents of Basic Workshop Practice and term work to be done in Semester –I & II are given together. The jobs for practice and demonstration are designed with the work of the course spread over two semesters.		

Text Books
1. W. A. J. Chapman, "*Workshop Technology- Part I, II and III*", Edward Arnold.
2. S K & A K Hajra Choudhary, "*Workshop Technology, Vol. I, II*", Media promotors and publishers pvt. Limited, 2007.
Reference Book
1. G. Boothroyd & W.A. Knight, "Fundamental of Machining and Machine Tools, third edition", CRC.

Constitution of India

Course Code	Course Name		
MC-BT001	Constitution of India		
Course Pre-requisites	------------		
Period per week (each of 60 minutes)	Lecture (hrs)	02	
	Practical (hrs)	-	
	Tutorial (hrs)	-	
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	60
	In semester Evaluation	---	---
	TOTAL	**---**	100

Course Outcomes:
1. CO1   To understand constitutional ethos and principles   2. CO2   To co-relate with political system and constitutional tenets   3. CO3   To inculcate and pursue the values of civic life   4. CO4   To exercise their rights and duties with rationale

Day No.	Topics	Hrs.
1	Historical background of constitution –preamble, rule of law, principle of basic structure Philosophy of constitution	7
2	Fundamental Rights – Duties –features, significance, limitations Directive principles – characteristics, importance role and dynamics	7
3	Legislature- composition, powers, sovereignty of parliament, Law making procedure, types of bills, motions	7
4	Executive- president - powers and functions, veto power, impeachment process, vice-president, council of ministers	7

5	Judicial Administration- supreme court, high court, subordinate courts Working of quasi – judicial bodies landmark cases- nanavati casw, shah bano, vishakha guidelines, kesavanand bharti, etc.	8

Reference Books:

1. D.C. Gupta – Indian Government and Politics

2. D.D. Basu – Introduction to the Constitution of India

3. P. M. Bakshi - The Constitution of India

4. M. V. Pylee - Constitutional History of India
5. Palekar- Indian govt and politics

Hands on Electronics

Course Code	Course Name
ES-BT229	Hands on Electronics

Course pre-requisites	successful completion of SEM. I Basic Electrical Engineering lab course.

Course Objectives
With the help of hands on circuits in the lab, verify characteristics and application of basic devices used in electronics.

Course Outcomes
Students will demonstrate the ability to 　1. Handle basic components in electronics laboratory. 　2. Understand, use and select the components based on the required application. 　Connect, test and trouble shoot the circuits

Course Content:		
Module	**Details**	**Hours**
1	Handling basic circuit components, breadboards, meters, SG, DSO etc. with the help of simple circuits.	2
2	Use of power supply circuit components (rectifier filter regulator)	6
3	To plot BJT, FET Characteristics based on practical values observed.	6
4	Hands on with op-amp circuits (Op-amp as inverting, non-inverting amplifier, buffer, adder subtractor etc.)	10
5	Solving Boolean expression and implementing the same with hands on.	6
	TOTAL	**30**

Text Books:
1. Robert Boylestad and Louis Nashelsky, 'Electronic devices and circuits', Prentice HalloIndia7thEdition, London.
2. Donald A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw-Hill publishing Company Limited, second edition, 2002.
3. D. Roy Choudhari and Shail B. Jain," Linear Integrated Circuits", 3rd Edition New age International Publishers.
4. Gayakwad Ramakant,"Op-Amps and Linear Integrated Circuits", 4 th Edition, PHI publication

Reference Books:

1. Bhargava,Kulshreshtha,Gupta:'Basic Electronic sand Linear Circuits' TTTI Chandigarh, Tata McGraw Hill, New Delhi. 1984
2. K.R.Botkar,"Integrated Circuits",KhannaPublication10th Edition,2006
3. David Bell, 'Electronic Devices and Circuits',5th Edition, Oxford University Press
1. Allen Mottershead, "Electronic Devices and Circuits an introduction", Prentice Hall of India, 2004