Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
Government Aided Autonomous Institute under Mumbai University
Andheri (W), Mumbai - 400058

COURSE CONTENTS

FIRST YEAR

Electrical Engineering

SEMESTER – I & II

Academic Year: 2025-26

Regulation 23

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BS-BTE101- Differential Calculus & Complex Numbers

Course Code	Course Name
BS-BTE101	**Differential Calculus and Complex Numbers (DCCN)**
Course pre-requisites	Std XI and XII Mathematics

Course Objectives

The main objectives of the course are

1. To Introduce Partial Differentiations and its applications to find Maxima and Minima, Jacobian.
2. To Introduce Complex Numbers and its applications to find roots of equations.
3. To Introduce Numerical Methods.

Course Outcomes

At the end of the course the students shall be able to

1. Evaluate partial derivatives and apply it to estimate maxima and minima of multivariable function.
2. Define complex numbers in Cartesian and polar form, compute exponential and integrals powers of complex numbers. To apply De-Moivre's theorem to determine roots of polynomial and express hyperbolic, inverse hyperbolic functions.
3. Solve system of simultaneous linear equations, find roots of algebraic equations and evaluate definite integrals using numerical methods.

Course Content

Module No.	Details	Hrs.
1	**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.	06
2	**Applications of Partial Differentiations:** Maxima & Minima of a function of two independent variables. Lagrange's method of undetermined multipliers	02
3	**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 $\sin(n\theta)$, $\cos(n\theta)$.	08
4	**Complex Numbers:** Circular and Hyperbolic functions. Inverse Circular and Inverse Hyperbolic functions. Logarithm of complex numbers functions, Roots of complex numbers.	06

5	**Numerical Methods:** Numerical solution of linear and non-linear equations using False position method, Newton-Raphson method. Numerical integration using Trapezoidal equations, by Gauss Elimination Method, Gauss Jordan Method, Gauss Jacobi Iteration Method and Gauss Seidel Iteration Method	06

For Self-study: Successive differentiations, n^{th} -derivative of Exponential, Trigonometric & Algebraic functions. Leibnitz's theorem and related examples. Expansion of functions, Taylor's series, Maclaurin's series and examples.

Text Books:-

1. Shanti Narayan (2005), "Differential Calculus", S.Chand Publications,30^{th} Edition, ISBN
   8121904714, 572 Pages
2. Kandasamy (2006), "Numerical Methods" S Chand & Company, ISBN 978-8121914383, 640
   Pages
3. B S Grewal (2014), "Higher Engineering Mathematics", Khanna Publications, 43^{rd}
   Edition, ISBN 8174091955, 1315 Pages.

Reference Books:-

1. Erwin Kreyszig (2010), "Advanced Engineering Mathematics" Wiley Eastern Limited,
   Singapore 10^{th} edition, ISBN 8126554231, 1148 Pages.
2. M K Jain, S R K Iyengar, R K Jain (2020) "Numerical Methods: Problems And Solutions" New Age
   International Private Limited; Third edition, ISBN 978-9388818926, 432 pages

BS-BTE102-Engineering Chemistry

Course Code	Course Name
BS-BTE102	Engineering Chemistry
Course pre-requisites	Std. XII Chemistry

Course Objectives

The objectives of this course are

1. To introduce the students to basic knowledge of , corrosion and its protection , electrochemistry and high performance polymers and materials
2. To introduce the student to theory, principles and mechanism of chemical processes.
3. To introduce the application of chemistry in engineering and technology
4. To introduce the student with different material characterization technique

Course Outcomes

Upon successful completion of the course, students should be able

1. Analyse process of corrosion and its protection methods
2. Able to identify high performance materials
3. Analyse energy storage and its application
4. Able to characterize material with different techniques

Course Content

Module No.	Details	Hrs.
1	**Corrosion and surface chemistry** Definition, Types of corrosion-Dry or Chemical Corrosion, Voltaic Cells / Galvanic Cells, Electrolytic Cells, Reversible Cells, Wet or Electrochemical corrosion, Bi-metallic corrosion, Concentration cell corrosion-differential Aeration corrosion, Pitting Corrosion, Water Line Corrosion, stress Corrosion, Inter-granular Corrosion. Electrochemical & Galvanic series, Polarization, over voltage, Passivity, Factors affecting rate of corrosion. Corrosion in electronic devices and photonic devices.	06
2	**Corrosion Prevention** Different technique for Corrosion prevention, Cathodic and Anodic Protection, Cathodic and Anodic coatings, Method for metal coating ,Galvanising & Tinning, Metal Cladding, Electroplating. Organic and Inorganic coating, paint, varnish Enamels, phosphate and chromate coating	04
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	06

4	**Electrochemistry and Energy Storage** Introduction, metallic conductors, Electrolytic conductor, Non electrolytes conductance of electrolytic solutions, factor affecting conductance, conduct metric titration, Electrochemical cell, electrode potential and EMF of galvanic cell, measurement of electrode potential, standard hydrogen electrode, Types of Electrode, primary and secondary batteries, Lithium-MnO_2 batteries, lead acid battery, Nickel metal hydride batteries, fuel cells hydrogen-oxygen fuel cells, phosphoric acid fuel cells, solid oxide fuel cells	06
5	**Analytical technique for materials evaluation and characterization** 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: Microindentation, Hardness Testing, Nanoindentation Hardness Testing, Rockwell Hardness Testing, ISO, EN, ASTM standardisation.	06

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. Shikha Agarwal (2015) Engineering Chemistry fundamentals and application ISNN 978-1-107- 47641-7

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

ES-BTE101- Engineering Mechanics

Course Code	Course Name
ES-BTE101	Engineering Mechanics
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 and dynamics (mechanics), and to apply those fundamentals to solve engineering problems.
2. To prepare the base for the students to study other engineering courses.

Course Outcomes

Upon successful completion of the course, students shall be able to

1. Understand types of forces and apply the concept of equilibrium, resolution and composition to coplanar forces
2. Analyse and solve problems related to friction between surfaces.
3. To find centroid and moment of inertia of plane areas.
4. To solve problems on kinematics and kinetics of particles.

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. **Equilibrium of coplanar force system:** Meaning of equilibrium, free body diagrams, equilibrium of concurrent, parallel and non-concurrent non-parallel (general) system of forces.	08
2	**Friction:** Laws of friction, angle of friction, angle of repose, cone of friction, Equilibrium of bodies on rough horizontal and inclined plane. Belt friction- flat belts on the flat pulleys (Only problems, no derivation of formula).	05
3	**Centroid of Plane Areas:** Concept of centroid of plane areas. Problems on centroid of composite areas. **Moment of Inertia:** Moment of inertia of plane areas, parallel axis theorem. Introduction to polar moment of inertia, product of inertia and	06

	mass moment of inertia. Problems on moment of inertia of composite areas.	
4	**Kinematics of particle:** Constant velocity and acceleration in rectangular coordinates. Motion along plane curved path, tangential and normal component of acceleration. (No derivations of formulas).	04
5	**Kinetics of particles:** Newton's laws of motion, D'Alembert's principle, linear motion. **Energy principles:** Work done by a force, potential and kinetic energy, power, work energy equation, principle of conservation of energy. Introduction to impulse momentum principle. **Kinetics of rigid bodies (Self study):** D'Alembert's principle for bodies under rotational motion about a fixed axis.	05
	TOTAL	**28**

Text Books

1. N. H. Dubey (2017); "Engineering Mechanics Statics and Dynamics", McGraw Hill Education, ISBN 9780071072595, 800Pages
2. M. D. Dayal (2017); "Engineering Mechanics", Published by M.D.Dayal

Reference 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. B. N. Thadani (1966); "Engineering Mechanics", Asia Publishing House, ISBN 0210269405, 655 pages.
4. Beer & Johnson (2013), "Engineering Mechanics", Tata McGraw Hill, ISBN 1259062919, 470 pages.
5. F. L. Singer (1975), "Engineering Mechanics", Harper & Raw Publication, ISBN 0060462329, 724 pages.
6. Nelson (2009), "Engineering Mechanics", Tata McGraw Hill, ISBN 0070146143
7. Shames (2006), 'Engineering Mechanics', Prentice Hall, India, ISBN 8177581236, 837 pages.
8. K. L. Kumar (1998), "Engineering Mechanics", Tata McGraw Hill, ISBN 0070681813, 673 pages.

ES-BTE102- Engineering Graphics

Course Code	Course Name
ES-BTE102	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. Students will be able to draw & solve the problems on curves, lines, planes, solids
2. Students will be able to identify the various geometries.
3. Students will be able to differentiate line, planes, solids etc.
4. Students will able to practice & interpret the drawing of orthographic, isometric, missingviews using any CAD software

Course Content

Module No.	Details	Hrs.
1	Lines, Lettering, Dimensioning and Scales. Engineering Curves: Conics - Parabola, Ellipse and Hyperbola. Involutes, Cycloidal Curves: Cycloid, Epi-cycloid, Hypocycloid, Spirals, Helix etc.	07
2	Projection of points & lines inclined to both the reference planes. Traces of the Lines on the Reference Planes.	05
3	Projection of Planes inclined to both the Reference Planes.	04
4	Projection of Right regular Solids: Regular Polyhedrons (Tetrahedron), Prisms, Pyramids, Cylinders, Cones inclined to both the Reference Planes.	05
5	Orthographic Projections, Sectional Orthographic, Missing views. Isometric Projections using Natural Scale, four center method, method of points, typical practical problems.	07
TOTAL		**28**

Text Books

1. N.D.Bhatt,'Elementary Engineering Drawing',Charotar Publishing House,
2. T.Jeyapovan, 'Engineering Drawing and Graphics, Vikas Publishing House
3. K.L.Narayana & P.Kannaiah, 'Engineering Graphics', Tata McGraw-Hill
4. Schmalstieg/Hollerer, 'Augmented Reality: Principles & Practice'.

Reference Books

1. K.Venugopal, 'Engineering Drawing and Graphics', New Age International Publishers,
2. Giesecke, Mitchell, Spencer & Hill, 'Technical Drawing', Macmillan PublishingCo.
3. Warren H. Luzadder, 'Fundamentals of Engineering Drawing', Prentice Hall ofIndia Pvt.Ltd
4. M.B.Shah & B.C.Rana, 'Engineering Drawing', Pearson Education
5. M.L. Dabhade, 'Engineering Graphics', Association of Technical Authors.

BS-BTE103- Biology for Engineers

Course Code	Course Name
BS-BTE103	Biology for Engineers
Course pre-requisites	NA

Course objectives

1. To familiarize the students with the basic biological concepts and their engineering applications.
2. To enable the students with an understanding of biodesign principles to create novel devices and structures.
3. To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
4. To motivate the students to develop the interdisciplinary vision of biological engineering.

Course Outcome

At the end of the course the student will be able to:

1. Understand basic biological concepts required to engineer application related to problems associated in biology
2. Evaluate the principles of design and development, for exploring novel bioengineering projects.
3. Corroborate the concepts of biomimetics for specific requirements.
4. Think critically towards exploring innovative biobased solutions for socially relevant problems.

Detailed Syllabus

Module	Topics	No. of Lectures
1.	**Introduction** Requirement of engineers to study biology, Origin of life, Evolution and cells **Biomolecules** Lipids, Carbohyd rates, water, amino acids, proteins, enzymes, nucleotides.	2
2.	**Cell structure, Function and Genetics** Prokaryotes and Eukaryotes, Cell cycle and Cell growth : Mitosis, meiosis, culture growth, Mendelevian Genetics	3
3	**DNA** DNA structure, DNA Replication, transcription and translation	3
4	**NATURE-BIOINSPIRED MATERIALS AND MECHANISMS** Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and	3

	aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and per fluorocarbons (PFCs). Biomimicry in Buildings constructed.	
5	**TRENDS IN BIOENGINEERING** Bio printing techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bio imaging and Artificial Intelligence for disease diagnosis. Self-healing Bio concrete (based on bacillus spores, calcium lactate nutrients and bio mineralization processes) and Bioremediation and Biomining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic)	3

Basic Electrical Engineering- I

Course Code	Course Name
ES-BTE103	**Basic Electrical Engineering -I**
Course pre-requisites	XII Physics

Course Objectives

The objectives of this course are
1. To discuss various laws/ theorems to analyze DC networks.
2. To understand steady state behavior of RLC circuits with AC source.

Course Outcomes

Upon successful completion of the course, students should be able
1. To apply laws and theorems for analyzing DC electrical circuits.
2. To analyze single phase AC electrical circuits in steady state.

Course Content

Module No.	Details	Hrs.
1	**Introduction to Electric Networks**: Single line diagram of typical AC supply system, Voltage source and current sources, linear passive and active elements, ideal and practical sources, concept of dependent and independent sources.	4
2.	**DC circuits** : Kirchhoff's laws, Nodal and Mesh analysis, Super-node and Super-mesh analysis, source transformation, Star-delta conversion.	7
3.	**Application of Theorems to DC circuit**: Superposition Theorem, Thevenin's and Norton's theorems, Maximum Power Transfer theorem for the circuits with dependent and independent sources.	7
4.	**Single phase AC circuits** I: A.C. source specifications, Steady state behavior of resistance, inductance and capacitance with AC source.	4
5.	**Single phase AC circuits** II: R-L, R-C, R-L-C series and parallel circuits. Phasor diagrams, power and power factor, use of capacitor for power factor improvement.	6
Total		**28**

Text Books

1.	Joseph A. Edminster (1965), 'Electrical Circuits', Tata McGraw Hill, New Delhi, 4 th Edition, 1965.
2.	D. P. Kothari and I. J. Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill, 2010.
3.	H. Cotton, 'Advanced Electrical Technology', Wheeler Publication, Allahabad,2011.
4.	Hughes, 'Electrical and Electronics Technology', Pearson, 2010.

5.	Roy Chaudhary D, 'Networks &Systems', New Age International Publisher.
6.	A. Chakrabarti, 'Circuit Theory (Analysis and Synthesis) ', 6th edition, 2010, Dhanpat Rai & Co. Ltd.

Reference Books
Vincent Deltoro, 'Electrical Engineering fundamentals', Pearson Education 2 nd Edition New Delhi.
W. H. Hayt and J. E. Kemmerly, 'Engineering Circuits Analysis', Tata-McGraw HILL Publication.
M.E. Van Valkenburg, 'Network Analysis'. Prentice-Hall of India Pvt. Limited, Eastern Economy Edition.
Mittal and Mittal, 'Basic Electrical Engineering', Tata McGraw Hill.

BS-BTE151- Engineering Chemistry- Lab

Course Code	Course Name
BS-BTE151	Engineering Chemistry 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. Find out composition of metals in different alloy
2. Carryout flash point and fire point of oil sample
3. Prepare and characterize new composite material
4. Measure molecular/system properties such as flash point/ fire point, conductance of solutions, redox potentials.

List of experiments

List of Experiments:

1. Estimation of Cu by iodometric ally
2. Estimation of Zn by complexometric titration
3. Estimation of Ni by complexometric titration
4. To determine ion exchange Capacity of ion exchange resin
5. To determine Acid-Value of the given Lubricating Oil
6. To determine Flash-Point/Fire-Point of lubricating oil
7. Preparation of biodiesel from edible oil
8. To determine Sulphur content in unknown sample
9. Thin layer chromatography
10. Determination of chloride content of water
11. To determine COD of an effluent sample
12. Removal of hardness of water by Ion-Exchange Column
13. To determine Total, Temporary & Permanent hardness of water sample
14. To determination of chloride content of water

ES BTE151- Engineering Mechanics Lab

Course Code	Course Name
ES-BTE151	Engineering Mechanics 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. Experimentally verify the principles of statics (mechanics).

List of Experiments

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

ES BTE152- Engineering Graphics Lab

Course Code	Course Name
ES-BTE152	**Engineering Graphics Lab**
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. Students will be able to draw & solve the problems on curves, lines, planes, solids
2. Students will be able to identify the various geometries.
3. Students will be able to differentiate line, planes, solids etc.
4. Students will able to practice & interpret the drawing of orthographic, isometric, missingviews using any CAD software.

Course Content

- Introduction to any CAD
- Construction of Engineering Curves using Sketch Book and CAD tool
- Construction of Projection of Lines & Traces of lines using Sketch Book and CAD tool.
- Construction of Projection of Planes using Sketch Book and CAD tool
- Construction of Projection of Solids using Sketch Book and CAD tool
- Construction of Orthographic projections for simpleparts using CAD tools.
- Construction of Isometric projections for parts usingCAD tool.

***Minimum 03 problems are expected to be constructed on each module using CAD software tools**

References-

1. N.D.Bhatt,'Elementary Engineering Drawing',Charotar Publishing House,
2. T.Jeyapovan, 'Engineering Drawing and Graphics, Vikas Publishing House
3. K.L.Narayana & P.Kannaiah, 'Engineering Graphics', Tata McGraw-Hill
4. Schmalstieg/Hollerer, 'Augmented Reality: Principles & Practice'

SE BTE101- Design thinking and Innovation

Course Code	Course Name
CODE :SE-BTE101	Design thinking and Innovation
Prerequisites	NA

Course Objectives

1. Study a problem from multiple perspectives
2. Learn how to frame the design challenge properly.
3. Learn how to ideate, prototype and Iterate solutions.
4. Learn from the overall design process how to create value as entrepreneurs
5. Learn how to design successful products or enterprises

Course Outcomes

At the end of the course the student will be able to:

1. Identify problems and convert them into innovation opportunities using structured design thinking opportunities.
2. Develop and frame viable product/service ideas with a user centered approach.
3. Apply empathy-based research tools to understand user needs and behaviours.
4. Create and test prototypes and effectively communicate/ pitch the designed solution.

Detailed Syllabus

Module No	Topics	No. of Lectures
1.	**Introduction to Design Thinking** Introduction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, Make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking	8
2.	**Design Thinking Methodology:** The 5 Stages of the Design Thinking Process-Empathise, Define (the problem), Ideate, Prototype, and Test.	8
3	**Empathize -** Understand customers, Empathy Maps, Empathise-Step into customers shoesCustomer Journey Maps, Define- Analysis & Drawing Inferences from Research	8
4	**Ideation tools & exercises.** Sample Design Challenge, Introduction to the Design Challenge Themes,Story telling and Tools for Innovation	8
5	**The Design Challenge**: Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing Documentation and the Pitching	8

Text book

Karmic Design Thinking by Prof. Bala Ramadurai, available at Amazon (paperback), Amazon (e- book), Flipkart, Pothi, halfpricebooks.in

Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School, 2013, Wiley Publications

References

Innovation and Entrepreneurship by Peter F. Drucker (Special Indian Edition). Routledge
Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, 2009
Zero to One: Note on Start-Ups, or How to Build the Future
The Lean Startup: How Constant Innovation Creates Radically Successful Businesses Start With Why: How Great Leaders Inspire Everyone To Take Actions.

VS BTE101- Workshop Practice

Course Code	Course Name
VS-BTE 101	Workshop Practice
Course pre-requisites	Basic Sciences of XII

Course Objectives

The objectives of this course are

1. To impart skill-based knowledge to students about types workshop in engineering.
2. To give "hands on" training and practice to students for use of various tools, devices, machines, and electrical circuitry and equipments in the workshops.
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 impart knowledge on various safety standards practiced while working different types of workshops.

Course Outcomes

Pon successful completion of this course student will be able to:

1. Know various tools, machines, devices used in engineering practice for creating objects from raw material.
2. Know various operations in basic engineering shops and electrical circuitry and appliances.
3. Know various safety precautions to be taken before, during and after the various basic engineering operations.

Interpret job drawings and electrical circuitry, plan and execute processes and operations to produce basic components and basic electrical circuits.

Module No.	Details	Hrs.
01	Fitting: - 1. Use and settings of fitting hand tools for marking, chipping, cutting, filing, centre punching, hammering, drilling, tapping. **2.** Term work to include one job: - Male –female joint involving above operations.	08
02	Carpentry:- 1. Use of planning tool, Table saw, hand saw, mortise tool, marking tools, chisel and mallet. **2.** Term work to include one job: Cross Lap Joint involving above carpentry tools.	08
03	Forging / Smithy: -	

	Term work to include one job: - Lifting Hook and Handle to be demonstrated by instructor to batch in group of 4-5 students.	04
04	Electrical Workshop: - 1. Electrical Board Wiring: - House wiring, Staircase wiring, Go-down wiring, Single phase Fan connection, Three phase connection for electrical motors. 2. Demonstration of fluorescent tube light connection. **3.** Demonstration of Soldering.	08

Term Work
Term work shall comprise of The evaluation based on the skills learned while completing the job in each workshop trade and the submission of the job along with the Workshop Journal.

Text Books
1. S. K. & A. K. Hajra Choudhary, "*Workshop Technology, Vol. I, II*", Media promotors and publishers pvt. Limited, 2007. 2. R. S. Khurmi, J. K. Gupta, "A Textbook of Workshop Technology (Manufacturing Processes)", S Chand & Company Pvt. Ltd. 2008.
Reference Books
1. G. Boothroyd & W.A. Knight, "Fundamental of Machining and Machine Tools, third edition", CRC. 2. W. A. J. Chapman, "*Workshop Technology- Part I, II and III*", Edward Arnold.
Online Reference Material
1. https://www.youtube.com/watch?v=YV9Y_J1Ipa0 (Video in Marathi Language). 2. https://www.youtube.com/watch?v=jbRgJbIGAwc (Video in Hindi Language). 3. https://www.youtube.com/watch?v=-1ov1jn7m-w (Video in Hindi Language).

VS BTE101- Ethics, Values and Life skills

Course Code	Course Name
VE-BTE101	**Ethics, Values and Life skills**

Course Objectives

1	To enable students to understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world- view
2	To develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.
3	To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work.
4	To develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.
5	To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside and achieve excellence with ethics.

Course Outcome (CO) statements and module- wise mapping

CO No.	Statements	Related Module/s
CO 1	Demonstrate a set of practical skills such as self-management, and learn to make a positive and favorable impression	**01**
CO 2	Train their mind to think rationally and logically and help a person to deliberate upon moral principles	**02**
CO3	Become conscious practitioners of righteousness and deepen understanding of the ultimate goal in life	**03**
CO 4	Realize their potential as human beings and conduct themselves properly in the ways of the world	**04**

Course Content		
Module No.	**Details**	**Hrs.**
01	**Ethics and Human Interface:** Why Study Ethics and values? Basics of Ethics, Human Values and its importance, Ethics in private and public relations, Moral thinkers and philosophers. Human Life, its aim and significance: Ethical and decision-making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.	03
02	**Development of positive attitude**: Harmony in Personal and Social Life: Concept of personal and group Ethics; Balance between - rights and duties- welfare of self and welfare of all. Creating a value based work culture in hostel, classroom and other places in the campus and society.	03
03	**Intellectual, Emotional, Creative, Ethics and spiritual development**: Aesthetic sense, Self-dependency, Activeness.	02
04	**Choosing the right path:** Character, Righteousness and Virtues for a Meaningful Life: Self- Awareness, Self -Management, Ego lessness, Humility, Righteousness, Purity, Truthfulness,	03
05	**Mindfulness:** Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maturity, Comradeship, Cooperation, Tolerance.	03

Assignments:

1. Project based assignment
2. Internal Assessment
3. Mind mapping, Journaling
4. Presentations
5. Story Writing

List of Text Books

1. A Textbook on Human Values and Ethics; Debrata Basu & Samarpan Chakraborty; October 2020: New Delhi publishers.
2. Social Ethical And Moral Values & The Indian Education System Hardcover, 1 January 2019 by Dr.B.Ramaswamy (Author)
3. Handbook on Human Values and Professional Ethics 2 by Dr S. K.

CC BTE101- Co-Curricular Course

Course Code	Course Name
CC- BTE101	**Yoga**
Course pre-requisites	NA

Course Objectives

The main objectives of the course are

1. Strength Development & Balanced Lifestyle
2. Physical & Mental Health Conditioning
3. Relaxation from anxiety & stress
4. Emotional Discipline & Control

Course Outcomes

At the end of the course the students shall be able to

1. Establish an overall Mind, Body & Breathe Alignment
2. Develop a true form of own self-weight exercises through the asana series
3. Maintain overall physical health through forms & balanced diet
4. Establish an increase in the range of motion & Self-awareness & mindfulness
5. Cultivate a positive Mindset and Conscious approach towards any situation

Course Content

Module No.	Details	Hrs.
1	**Definition & Historical Background of Yoga Introduction to Ashtanga Vinyasa** **Sanskrit Shlokas:** Opening & Closing Prayer **Pranayama Techniques:** Surya & Chandra Nadi pranayama, Surya & Chandra Bhedna, Nadi Shodhan, Omkara Meditation, Bhastrika Pranayama, Kapalbhatti Pranayama, Bhramari Pranayama. **Suryanamaskara A & Suryanamaskara B**	06
2	**Traditional Ashtanga Vinyasa Primary Series**: Standing Asanas - Sitting Asanas **Learning the Vinyasa flow Technique Closing Asanas in the Primary series Flow** **Nauli Kriy**a Technique, **Simhasana Garjanasana**	06
3	**Meditative Asanas:** Siddhasana, Padmasana, Vajrasana, Sukhasana, Gaumumkhasana and performing the pranayama in the above asanas. Inversions & Arm Balance Asanas Learning the **Varki**	04

	Kriya Eye Palming and RotationsBlinking, Flexing Techniques	
4	**Spinal Twists:** Performing the Kapalbhati Pranayama in these Twisting Asanas Learning the technique of **Yogic Bandhas** & applying it during the meditation **Five Norms of Social & Personal Living Eight Limbs of Ashtanga Yoga**	02
5	**Types of Asanas** **Introduction to Ayurveda** **PanchaMahaBhoota** **Detailed Discussion on Doshas & Types** **Balanced Diet & Lifestyle (Dincharya)** **Introduction to Koshas & Types**	02

For Self-Practise: Suryanamaskara A & Suryanamaskara B, Breathing Techniques in Sukhasana, Omkara Chanting & Meditation, Cat & Cow Stretch, SetuBandh Asana, Malasana, Spinal Twists in Sukhasana, Gaumukhasana, Padmasana, Back Bends with wall, Tadasana.

Reference Books:-

1. Yoga Mala: The Original Teachings of Ashtanga Yoga Master Sri K. Pattabhi Jois
2. Yoga Makaranda Book by Tirumalai Krishnamacharya
3. **Ashtanga Yoga: The Practice Manual** by David Swenson
4. Light on Pranayama: The Yogic Art of Breathing by B.K.S. Iyengar

Video Links:-

Guided Ashtanga Half Primary Series by Laruga Glaser
https://youtu.be/hW9mu7rEfQ4?si=aFymgVHh2aKIuNye

COURSE CONTENTS

Semester II

F. Y. B.Tech.
ELECTRICAL ENGINEERING

Academic Year: 2024-2025

Regulation 23 (R23)

BS BTE201- Integral Calculus and Differential Equations

Course Code	Course Name
BS-BTE201	**Integral Calculus and Differential Equations (ICDE)**
Course pre-requisites	BSBT101 (DCCN)

Course Objectives

The main objectives of the course are

- Introduce Ordinary Differential Equations of First Order and Higher Order with constant coefficients.
- Introduce Double and Triple Integrals.
- Apply Double and Triple Integrals to find area, mass and volume.

Course Outcomes

At the end of the course the students shall be able to

- Apply the knowledge of first order and higher ordinary differential equation in different engineering applications.
- Set up and evaluate multiple integrals for regions in the plane.
- Find Area of the region bounded by curves and to find volume and Mass of solid geometric figures.

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. Numerical Solution of first order ordinary differential equations using Taylor's series, Euler and Modified Euler's methods, Runge Kutta method of fourth order.	08
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. Simple applications of differential equations of first and second order to Engineering problems.	06
3	**Double Integrals** Introduction to Double Integrals, Change of order of double integral. Evaluation of double integral by changing to polar coordinates.	06
4	**Triple Integrals** Introduction to Triple Integrals, Evaluation of Triple Integrals using Cartesian, Cylindrical and Spherical, Polar coordinates.	06

5	**Applications of Multiple Integrals** Applications double integrals to find area and mass of lamina, Applications of Triple Integrals to find volume.	02

Course Content For Self-study: Gamma function, reduction formula. Beta function. Duplication formula, Relation between Gamma and Beta Functions. Curve tracing in Cartesian and Polar Coordinates. Rectification of plane curves.

Text Books:

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

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 page.

BS-BTE202- Engineering Physics

Course Code	Course Name
BS-BTE202	Engineering Physics
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.
3. To understand differential operator Del, theory of static electric and magnetic fields using principles of divergence and curls. To learn Maxwell's equations and how he incorporated corrections in certain equations.
4. To examine various ways of producing ultrasonic waves and its applications.
5. To explain working principles of LASERs and optical fibres.

Course Outcomes

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 concepts of gradient, divergence, curls and to explain Gauss' law and Ampere's law. Analyse electromagnetism before and after Maxwell, electromagnetic wave equations.
4. Learn principles of production of ultrasonic waves using magnetostriction and piezoelectric methods and various applications related to ultrasonics.
5. 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 further explain application of LASERs in holography. Explain working principle of optical fibres and its applications.

Course Content

Module No.	Details	Hrs.
1	**Wave nature of particles** Wave particle duality, X-rays- types of X-rays, continuous and characteristic X-rays, 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 experiment and Gamma ray microscope experiment; Applications of uncertainty principle.	6

2	**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.	6
3	**Electromagnetism and Electromagnetic waves** 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. Divergence and curl of B, BiotSavart law, magnetic vector potential. Comparison of Electrostatics and Magnetostatics. Electrodynamics before Maxwell, Maxwell's equations, Maxwell's equations in matter.	8
4	**Ultrasonics** Principles of production, piezoelectric and magnetostriction effects, piezoelectric and magnetostriction oscillators, ultrasonic materials – quartz and ferroelectric materials. Applications: Echo sounding, Non-Destructive Techniques	5
5	**Fiber optics communication and LASER:** Optical fiber: Propagation of light in an optical fiber- TIR, Angle of Acceptance; Numerical Aperture; Types of Optical Fibers; Advantages of Optical Fiber, Applications. LASER: 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. Applications.	5

Text Books:

1. Kshirsagar and Avadhanulu, 'A textbook of Engineering Physics', S. Chand Publications, 1992
2. A.S. Vasudeva, 'Modern Engineering Physics', S. Chand Publications, (2008),
3. Hitendra K Malik and AK Singh , 'Engineering Physics', McGraw Hill Publications, (2013)
4. G Vijayakumari, 'Engineering Physics', Vikas Publishing house, (2006)

Reference Books:

1. Arthur Beiser , 'Concepts of Modern Physics', Tata McGraw Hill, 6th Edition, (2009)
2. Robert Eisberg, Robert Resnick , 'Quantum Physics of atoms, molecules, solids, nuclei and particles', Wiley India pvt. Ltd, 2nd Edition, (2006)
3. David J. Griffiths , 'Introduction to Electrodynamics', PHI Publications, 4thEdition, (2012)
4. K. Thyagarajan and AjoyGhatak , 'Lasers theories and application' Springer, 2nd Edition, (2006)

BS-BTE201- Basic Electrical Engineering II

Course Code	Course Name
ES-BTE201	Basic Electrical Engineering II
Course pre-requisites	XII Physics, Basic Electrical Engineering I

Course Objectives

The objectives of this course are
1. To discuss various laws/ theorems to analyze AC networks..
2. To understand coupled circuits.
To understand three phase balanced and unbalanced AC system.

Course Outcomes

Upon successful completion of the course, students
should be able 1 To apply laws and theorems for
analyzing AC electrical circuits.
2. To analyze coupled circuits.
3. To analyze three phase balanced AC system.

Course Content

Module No.	Details	Hrs.
1.	**AC Circuit Analysis** Kirchhoff's laws, Nodal and Mesh analysis, Super-node and Super-mesh analysis, source transformation.	6
2.	**Application of Theorems to AC circuits**: Superposition, Thevenin's and Norton's theorems, Maximum Power Transfer theorem for analysis AC circuits with dependent and independent sources.	6
3.	**Resonance in AC circuits**: Series and parallel Resonance, concept of Bandwidth and Q-factor.	4
4.	**Analysis of coupled circuits**: Self and Mutual inductance of simple configurations, Magnetic coupling, coefficient of coupling, dot convention, equivalent circuit.	5
5.	**Three phase AC circuits**: Three phase system, star and delta connections with Balanced load, Relationship between phase and line current and voltages, phasor diagrams, Three phase power calculation, power measurements, concept of unbalanced load.	7
Total		**28**

Text Books	
1.	Joseph A. Edminster (1965), 'Electrical Circuits', Tata McGraw Hill, New Delhi, 4 th Edition, 1965.
2.	D. P. Kothari and I. J. Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill, 2010.
3.	H. Cotton , 'Advanced Electrical Technology', Wheeler Publication, Allahabad,2011.
4.	Hughes, 'Electrical and Electronics Technology', Pearson, 2010.
5.	Roy Chaudhary D, 'Networks &Systems', New Age International Publisher.
6.	A. Chakrabarti, 'Circuit Theory (Analysis and Synthesis) ', 6th edition, 2010, Dhanpat Rai & Co. Ltd.
Reference Books	
1.	Vincent Deltoro, 'Electrical Engineering fundamentals', Pearson Education 2 nd Edition New Delhi.
2.	W. H. Hayt and J. E. Kemmerly, 'Engineering Circuits Analysis', Tata-McGraw HILL Publication.
3.	M.E. Van Valkenburg, 'Network Analysis'. Prentice-Hall of India Pvt. Limited, Eastern Economy Edition.
4.	Mittal and Mittal, 'Basic Electrical Engineering', Tata McGraw Hill.

PC BTE201- Electronic Circuits

Course Code	**Course Name**
PC-BTE201	**Electronic Circuits**
Course pre-requisites	XII Physics

Course Objectives

The objectives of this course are

1. Introduce Rectifiers, filters, clipping and clamping circuits.
2. Discuss various transistors (BJT and FET) and its biasing techniques.
3. Discuss Op-amp and its practical applications.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Understand rectifiers, various types of filter circuits, clippers and clampers.
2. Perform DC and AC analysis of BJT , FET, Differential amplifiers.
3. Understand basics of op-amp and select appropriate electronic components for various op-amp circuits depending on application required.

Course Content

Module No.	**Details**	**Hrs.**
1	Rectifiers using diodes, filters.	**05**
2.	Application of diode as clippers, clampers	**03**
3.	Bipolar Junction Transistor: Different biasing techniques, Introduction to h- parameter equivalent circuit, Introduction to Stability Factors.	**06**
4.	Field Effect Transistor: Different biasing techniques, Introduction to ac equivalent circuit. Introduction to MOSFET	**06**
5.	Differential Amplifier Circuit Configuration: Introduction to DIBO, DISO, SIBO, SISO. Differential amplifier with swamping resistors, constant current bias and current mirror.	**05**
6.	Operational amplifier(Op-amp):Block diagram representation of typical Op-Amp, equivalent circuit.	**08**
7.	Op-amp applications: Summing, scaling and averaging amplifiers, instrumentation amplifier, V to I converter(with floating load and grounded load), I to V converter, Differentiator, integrator, Precision rectifier, half wave and full wave, comparator, zero crossing detector, Schmitt trigger, clipper, clamper, Peak Detector.	**09**
	Total	**42**

For Self-Study : ADC and DAC circuits using Op-Amp

Text Books

1. Robert Boylestad and Louis Nashelsky, „Electronic devices and circuits theory ", 11th ed
2. Donald A. Neamen,"Electronic Circuits Analysis and Design",. (SIE) 3rd edition 2006
3. Gayakwad Ramakant,"Op-Amps and Linear Integrated Circuits", Pearson 2015
4. D. Roy Choudhari and Shail B. Jain," Linear Integrated Circuits", New age International Publishers, 4th edition, 2018

Reference Books

1. Bhargava,Kulshreshtha,Gupta:„Basic Electronics and Linear Circuits" NITTTR Chandigarh,2nd edition, 2013.
2. David Bell, Electronic Devices and Circuits",5thEdition,Oxford University Press, 2008
3. Allen Mottershead,"Electronic Devices and Circuits an introduction", Prentice Hall of India, 1979
K.R.Botkar,"IntegratedCircuits",KhannaPublication, 10th edition, 1987

BS-BTE251- Engineering Physics Lab

Course Code	Course Name
BS-BTE251	Engineering Physics Lab
Course pre-requisites	XII Physics, Engineering Physics theory

Course Objectives

1. To setup theory related laboratory experiments on optics, Lasers and semiconductors so as to apply his/her theoretical knowledge to a practical situation.

Course Outcomes

1. Explain unit cell properties of different crystal structures studied in the theory.
2. Calculate the velocity of sound in a given medium using ultrasonic interferometer.
3. Explain Hall effect in semiconductors.
4. Explain LASER diffraction.
5. Optical Fibre communication technique/ Optical techniques of interference (Newton's rings setup) to find wavelength of sodium light source.

Course Content

Module No.	Details	Hrs.
1	Demonstration of unit cell properties of different cubic structures.	2
2	Demonstration of important plane orientations and planar atomic densities of cubic planes.	2
3	Hall effect in semiconductors	2
4	Ultrasonic interferometer- measuring velocity of ultrasonic waves in a given medium.	2
5	Optical Fibre communication technique/ Optical techniques of interference (Newton's rings setup) to find wavelength of sodium light source.	2

Text Books:

1. Kshirsagar and Avadhanulu, 'A textbook of Engineering Physics', S. Chand Publications, 1992
2. A.S. Vasudeva, 'Modern Engineering Physics', S. Chand Publications (2008),
3. Hitendra K Malik and AK Singh , 'Engineering Physics', McGraw Hill Publications, (2013)
4. G Vijayakumari, 'Engineering Physics', Vikas Publishing house, (2006)

Reference Books:

1. Arthur Beiser , 'Concepts of Modern Physics', Tata McGraw Hill, 6th Edition, (2009)
2. Robert Eisberg, Robert Resnick , 'Quantum Physics of atoms, molecules, solids, nuclei and particles', Wiley India pvt. Ltd, 2nd Edition, (2006)
3. Charles Kittel, 'Introduction to Solid State Physics', John Wiley & Sons, 8th Edition, (2004)
4. S.O. Pillai, 'Solid State Physics', 6th Edition, New Age International Publishers, (2010)
5. K. Thyagarajan and AjoyGhatak , 'Lasers theories and application' Springer, 2nd Edition, (2006)

ES-BTE251- Basic Electrical Engineering Lab

Course Code	Course Name
ES-BTE251	**Basic Electrical Engineering Lab**
Course pre-requisites	Standard XII Physics

Course Objectives

1. Understand the use of various network laws/ theorems for DC networks.
2. Introduce to AC circuits and power measurement.
3. To Introduce Two port networks.

Course Outcomes

Upon successful completion of the course, the students will have ability
1. Evaluate response of DC electrical circuits using theorems.
2. Analyse AC circuits and determine different circuit parameters.
3 Use simulation software / hardware instruments for the analysis of networks.

Course Content

Tutorials:- Minimum one Tutorial on each chapter

List of suggested experiments-
(Any eight to ten experiments from following list)
1) Verification of Kirchhoff's Laws.
2) Verification of Theorems (Superposition, Thevenin, Norton, Maximum Power Transfer Theorem).
3) Determine Inductance & Internal Resistance of R-L circuits.
4) Determine Capacitance of R-C circuits..
5) Observe waveforms and phase difference in AC circuits.
6) Observe the effect of adding capacitor on power factor improvement.
7) Analysis of Series / Parallel Resonance.
8) Experimentally determine Two port network parameters.
9) Single phase and Three phase power measurement.
10) Measurement of reactive power.
11) Simulation of Dc and Ac circuits.

References-

1) Joseph A. Edminster (1965), 'Electrical Circuits', Tata McGraw Hill, New Delhi, 4 th Edition, ISBN 0070189749
2) M.E. Van Valkenburg: Network Analysis. Prentice-Hall of IndiaPvt. Limited, Eastern Economy Edition.
3) Roy Chaudhary D.: Networks &Systems, New Age International Publisher
4) W. H. Hayt,and J. E. Kemmerly: Engineering Circuits Analysis, Tata-McGraw HILL Publicatio.
5) Chakrabarti A.: Circuit Theory (Analysis &Synthesis), Dhanpat Rai &Co.
6) Schaum"s Outline Series: Electrical network
7) Mittle and Mittle (2005), 'Basic Electrical Engineering', Tata McGraw Hill.

PC-BTE251- Electronics Circuits Laboratory

Course Code	Course Name
PC-BTE251	**Electronics circuits Lab**
Course pre-requisites	Standard XII Physics

Course Objectives

The objectives of this course are

1. Use of diode as Rectifier, filter, clipper and clamper
2. Analysis of transistors, practical applications of Op-amp.
3. Working of Differential amplifier, calculation of CMRR

Course Outcomes

Upon successful completion of the course, students should be able to

1. Select appropriate electronic components to design rectifiers, filters , clippers and clampers
2. Calculate gain of transistors.
3. Calculate CMRR of differential amplifier, Select appropriate electronic components to design various op-amp circuits depending on application required.
4. Write and present project report in a team.

Course Content

Module No.	Details	Hrs.
1	Diode as rectifier , with filter	**02**
2	Diode as clipper	**02**
3	Diode as clamper	**02**
4	BJT/FET amplifier	**02**
5	Differential Amplifier	**02**
6	Transfer Characteristics of op-amp	**02**
7	V to I converter	**02**
8	Integrator	**02**
9	Differentiator	**02**
10	Schmitt Trigger	**02**
11	Instrumentation Amplifier	**02**

Term work shall comprise of any 8 experiments out of/similar to the reference list provided above.

1. Practical examination/ MCQ Examination based on any 8 experiments performed from the above list.
2. Mini Project*

*Mini Project: There will be a course mini project where the students will be able to apply and integrate the knowledge gained during the course. The projects will be developed by teams of four to five students. The group has to present the project and submit the project report

Text Books

1. Robert Boylestad and Louis Nashelsky, "Electronic devices and circuits theory", 11th edition Pearson 2017.
2. Donald A. Neamen, "Electronic Circuits Analysis and Design" (SIE) | 3rd edition 2006.
3. Gayakwad Ramakant, "Op-Amps and Linear Integrated Circuits", Pearson 2015
4. D. Roy Choudhari and Shail B. Jain, "Linear Integrated Circuits",New age International Publishers, 4th Edition, 2018.

VS-BTE201- Electrical Workshop

Course Code	**Course Name**
VS-BTE201	Electrical Workshop
Course pre-requisites	Basic Sciences of XII, Workshop Practice

Course Objectives

The objectives of this course are

1. To impart skill-based knowledge to students about types workshop in engineering.
2. To give "hands on" training and practice to students for use of various tools, devices, machines in the workshops.
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 impart knowledge on various safety standards practiced while working in different types of workshops.

Course Outcomes

Upon successful completion of this course student will be able to:

1. Know various department specific tools, machines, devices used in engineering practice for creating objects from raw material.
2. Know various department specific operations in basic engineering shops and electrical circuitry and appliances.
3. Know various safety precautions to be taken before, during and after the various basic engineering operations.
4. Interpret job drawings and/or electrical circuitry, plan and execute processes and operations to produce basic components and/or basic electrical circuits.

Course Content

Module No.	**Details**	**Hrs.**
01	Welding: • Edge preparation for welding jobs, arc welding, demonstration on different types of joints such as Lap Welding and Butt Welding.	08
02	Advance Electrical Workshop I: • Wiring, control and maintenance of domestic appliances like Mixer machine, Electric Iron, fan, motor, etc. • Energy measurement and understanding electricity billing. • Electrical Installations demonstration: Components of LT Switchgear such as Switch Fuse Unit (SFU), MCB, ELCB, Types of Wires and Cables, different types of batteries. • Study of Electric shock phenomenon, precautions, preventions, Earthing.	10
03	Advance Electrical Workshop II: • Study of estimation and costing of wiring. • Wiring of Motor starters • Energy measurement and tariff calculation • Familiarization of electronic components, colour code, multi-meters. • Bread board assembling- given electronic circuit. • Soldering practice-any one circuit. • PCB wiring and fault Identification of appliances like Electronic Ballast, fan regulator, inverter, UPS.	10

Term Work

Term work shall comprise of

The evaluation will be based on the skills learned while completing the job in each workshop trade and the submission of the job/Journal/report on demonstration.

Text Books

1. S. K. & A. K. Hajra Choudhary, "*Workshop Technology, Vol. I, II*", Media promotors and publishers pvt. Limited, 2007.
2. R. S. Khurmi, J. K. Gupta, "A Textbook of Workshop Technology (Manufacturing Processes)", S Chand & Company Pvt. Ltd. 2008.

Reference Books

1. G. Boothroyd & W.A. Knight, "Fundamental of Machining and Machine Tools, third edition", CRC.
2. W. A. J. Chapman, "*Workshop Technology- Part I, II and III*", Edward Arnold.
3. K. B. Raina & S. K. Bhattacharya, Electrical Design Estimating and costing, New Age International Publishers, New Delhi, 2005.
4. Uppal S. L., Electrical Wiring & Estimating, Khanna Publishers---5th edition, 2003.
5. John H. Watt, Terrell Croft American Electricians' Handbook: A Reference Book for the Practical Electrical
6. Man, 9th ed. McGraw-Hill, 2002.
7. G. Randy Slone, Tab Electronics Guide to Understanding Electricity and Electronics, 2nd ed. McGraw-Hill, 2000.
8. Jerry C Whitaker, The Resource Handbook of Electronics, CRC Press-2001.

Online Reference Material

1. https://www.youtube.com/watch?v=ZLWZlyLa00Y (Video in Marathi Language).
2. https://www.youtube.com/watch?v=NELhcl_23vs (Video in Hindi Language).
3. https://www.youtube.com/watch?v=mP7zbTGV_rI
4. https://www.youtube.com/watch?v=3XGt-p-hpdU

SE-BTE201- Programming for Problem Solving

Course Code	Course Name
SE-BTE201	**Programming for Problem solving**
Course pre-requisites	Basic Knowledge of computers
Course Objectives	
1. Master basic procedural programming constructs for decision and iteration. 2. Write and debug small programs. 3. Manipulate various Data types and Apply basic programming concepts like loops, functions, arrays in programs. 4. Apply Object Oriented programming approach to various problem statements.	
Course Outcomes	

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.
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. Concept of Variables and constants, Data types, operators, Input / Output from console, expression, etc. **Skill to be developed**: 1. Given a problem statement student should be able to give an approach to code the program which can be in forms of steps (algorithm) or graphical (Flow chart). 2. Students should be able to build a basic C++ program. 3. Students should be able to Write Programs Using Operators and Expressions.	06
2	**Control Structure**: Conditional execution Iteration Looping **Skill to be developed**: 1. Students should be able to Write Programs Using If-Else statement, Switch statement. 2. Students should be able to Write Programs Using nested If-Else statement. 3. Students should be able to write Programs Using While, Do-While loops. 4. Students should be able to Write Programs Using FOR loops. 5. Students should be able to write Programs Using nested Loops.	12
3	**Functions:** Defining Functions- Procedural decomposition of problems, localizing variables, parameter passing– value and reference, return values. **Special Functions Concepts**: Recursive functions **Skill to be developed**: Students should be able to Write Programs Using Functions of various types	12
4	**Special Functions Concepts**: Recursive functions **Skill to be developed**: Students should be able to Write Programs Using special functions.	04

5	**Introduction to Data Structures** Arrays – one-dimensional, Multidimensional **Strings** **Skill to be developed**: 1. Students should be able to Write Programs Using 1-D arrays. 2. Students should be able to Write Programs for matrix manipulations using 2-D arrays. 3. Students should be able to Write Programs involving strings and its manipulations.	08
6	**Introduction to Object Oriented Programming** Object Oriented Language concepts – classes, objects, Constructor and Destructors. Inheritance – Access specifiers, Types of Inheritance with examples. **Skill to be developed**: 1. Students should be able to write basic OOPs Programs Using classes and objects. 2. Students should be able to Write Programs using Constructor and constructor overloading Students should be able to Write Programs involving Inheritance	06
7	**Features of Object Oriented Programming** **Compile time polymorphism** Introduction to **Runtime Polymorphism**. **Skill to be developed**: 1. Students should be able to write Programs Using function overloading 2. Students should be able to Write Programs using operator overloading	08

For Self-study: Introduction to **Runtime Polymorphism**. **Text Books:**

1. BalaguruSwami ,"Object Oriented Programming with C++", 8th Edition, Tata McGraw-Hill Publishing Company Ltd. , 2020

2. Bjarne Stroustrup ,"The C++ Programming Language", 4th Edition, Addison Wesley Publishing Company, 2013

Reference Books:

1. Mahesh Bhave and Sunil Patekar , "Object- Oriented Programming with C+ + ", 2nd Edition, Pearson Education, 2012

2. Robert Lafore, "Object-Oriented Programming in C++", 4th Edition, Sams Publishing, 2001

Tentative Evaluation scheme:
Mid Term Test: Practical Exam of 30 Marks on module 1,2,3
End Sem Exam: Practical Exam of 50 marks covering all modules
Internal evaluation: 20 marks includes (mini project in groups/ MCQs, attendance, evaluation during regular practicals, etc)

AE-BTE201- Communication Skills

Course Code	Course Name
AE-BTE201	Communication Skills
Course pre-requisites	Standard XII English

Course Objectives

1. To learn the basics of grammar so as to help improve communication and speak a neutral and correct form of English so as to acquire proficiency in language and technical vocabulary.
2. To make the learners capable of understanding the 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 them in the Social and Professional sphere.
3. To acquaint the students with channels of communication in an organization and use them effectively in professional world.
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 correspondences 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. To be equipped for general aptitude, competitive examinations and placements through help of expanded technical vocabulary and summarization. Knowledge of good writing skills can help in the verbal section in aptitude tests, GRE, GMAT, CAT, TOEFL etc.
2. To Effectively and responsibly communicate in professional and social context and use interpersonal skills to enhance job effectiveness.
3. Students will inculcate effective listening, writing, reading and speaking skills (LSRW) and be equipped to express effective interpersonal skills.
4. Communicate result-oriented writing through Emails, Blogs, and Technical Writing. Business writing, storytelling, both within and outside organization.
5. Determine the attitudes and behaviors appropriate to workplace situations and settings and develop professionalism for better teamwork approach.

Course Content

Modules	Details	Hours
1	**Building advanced vocabulary:** Common errors, Pairs of confused words, Enriching vocabulary through Synonyms, antonyms, words through situations, one word substitution, comprehending technical passages, GRE passages, journal papers, articles to test the analytical skills and expression.	06
2	**Fundamentals of Communication:** Meaning, Definitions, Components, Objectives, Importance of Communication, Theories of Communication, Purpose of Professional	09

	Communication, Barriers to Communication (Cultural, Semantic, Psychological, physical, mechanical, organizational), Different Forms of Communication: Verbal, Non-Verbal, Intrapersonal. **Communication Channels in an Organization:** Different types of communication flow: Internal, External, Upward, Downward, Horizontal, Grapevine, Problems and Solutions.	
3.	**Techniques to Improve Communication:** • 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 – Storytelling. Story Writing – Daily story writing (approx. 100 words) to inculcate the practice of structured writing. • Listening Skills – Barriers to Listening, Listening & Note taking. • Writing Skills – Barriers and Techniques to writing skills	05
4.	**Business Writing: Letters (Introduction), Emails, Netiquette & Story Writing** • Principles of Business Correspondence, Routine letters, Business Correspondence: (Letter Writing) Introduction, Importance, Layout, Elements of style and Language, Types of formats-3, Types of letters: Routine letters, Enquiry and Reply, Order, Complaint and Adjustments, Sales Letters. • Emails – Tailoring effective email writing for different audiences: Senior Managers, Managers, and Team Members.	06
5.	**Etiquette and Mannerism in the Professional world:** • Introduction to Corporate Etiquette, Grooming, Clothing & Accessorizing • Technology Etiquette (social media, Telephone,)	04
	➢ **Tutorial work: 14 hours per batch** **Assignments:** 1. 2 assignments on Summarization and Comprehension, One word substitute 2. 3 assignments on techniques to improve communication 3. 3 practical sessions through public speaking, Speeches and Presentation 4. 3 assignments on Communication Theory, Etiquette Case Studies, Communication in a Business environment 5. 2 assignments on Business writing 6. Group Activity and role play 7. Daily story writing in 100 words for a period of 1 month	

Text Books and Reference Books

Sr. No	Text Book Titles	Author/s	Publisher	Edition	Module Nos.
1	Communication in Organizations	Dalmar Fisher	Jaico Publishing House	2nd	1
2.	Business Communication: Connecting at work	Hory Shankar Mukherjee	Oxford University Press	1st	All
3	Communication Skills	Meenakshi & Raman Sangeeta Sharma	Oxford University Press	1st	1
4	Business Correspondence & Report-writing	R.C. Sharma & Krishna Mohan	Tata McGraw Hill	2nd	2
5	Effective Technical Communication	Ashraf Rizvi	Tata McGraw-Hill	1st	5
6	Technical Writing & Professional Communication for non-native speakers of English	Thomas N. Huckin & Leslie A. Olsen	McGraw – Hill	2nd	5
7	Mastering Communication	Nicky Stanton	Palgrave Master Series	3rd	1

IK-BTE201- Indian Traditional Knowledge

Course Code	Course Name
IK-BTE201	Indian Traditional Knowledge
Course pre-requisites	Higher Secondary Education

Course Objectives

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course provides an introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system. The course also provides offers an overview of Indian philosophical traditions, Indian linguistic Tradition, and Indian artistic tradition.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain basics of Indian tradition and Indian traditional knowledge systems.
2. Describe basics of Indian traditional health care, technologies and its scientific perspectives.
3. Explain basics of Indian artistic, linguistic and philosophical tradition.
4. Co-relate the Indian traditional knowledge in modern scientific perspective

Course Content

Module No.	***Details***	***Hrs.***
1	**Indian Tradition:** Fundamental unity of India, India‟s heroic role in world civilization, The Indian way of life, Introduction to Indian tradition, The Scientific Outlook and Human Values.	04
2	**Basic structure of Indian Knowledge System:** Indian Traditional Scriptures, Exposure to 4-Vedas, 4-Upvedas (Ayurveda, Dhanurveda, Gandharvaveda, Sthapatya etc.), 6-Vedangas (Shiksha, Kalp, Nirukta, Vyakaran, Jyotish), 6-Upangas (Dharmashastra, Meemansa, Puranas, Tarkashastra/Logic) etc.	04
3	**Indian Knowledge System and Modern Science:** Relevance of Science and Spirituality, Science and Technology in Ancient India, Superior intelligence of Indian sages and scientists.	04
4	**Indian Traditional Health Care:** Importance and Practice of Yoga, Pranayam and other prevailing health care techniques.	04

5	**Indian Artistic Tradition:** Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature etc.	04
6	**Indian Linguistic Tradition:** Ancient Indian languages and literary Heritages, Phonology, Morphology, Syntax and Semantics.	04
7	**Indian Philosophical Tradition:** (Sarvadarshan)- Nyay, Viaishepik, Sankhya, Yoga, Meemansa, Brief understanding of Philosophy of Charvaka, Bhagwan Mahaveer Jain, Bhagwan Buddha, Kabeer, Guru Nanak Dev and other eminent	04
Term Activities		
The Term Activities will consist of one assignment on each module, group discussions, presentations, case study on various topics based on above curriculum. Required attendances, involvement in academic activities related to course and overall conduct carry weightage.		

Text Books:

1. Ajwani L.H., *Immortal India*, Vora & Co. Publishers, 1997.
2. Swami Jitatmananda, *Modern Physics and Vedanta*, Bharatiya Vidya Bhavan, 2004.
3. Krishnamurthy, V. *Science and Spirituality- A Vedanta Perception*, Bharatiya Vidya Bhavan, 2002.
4. Sharma D.S., The Upanishadas- An Anthology, Bharatiya Vidya Bhavan, 1989.
5. Raman V.V., *Glimpses of Indian Heritage,* Popular Prakashan,1993.

Reference Books:

1. Sivaramakrishnan, V., *Cultural Heritage of India- Course Material*, Bharatiya Vidya Bhavan, Mumbai 5_{th} Edition, 2014.
2. Capra F., Tao of Physics, Shambhala, 2010.
3. Chaterjee S.C. and Datta D.M., *An Introduction to Indian Philosophy*, University of Calcutta, 1984.
4. Krishna Chaitanya, *Arts of India*, Abhinav Publications, 1987.
5. Jha V.N., *Language, Thought and Reality*

CO CURRICULAR ACTIVITY II