

# Bachelor of Technology

## (B Tech)

## Detailed Syllabus

## 2022 Batch onward

### [Common to All Branches]



**NIST Institute of Science and Technology (Autonomous)**

Institute Park, Pallur Hills, Berhampur, Odisha, INDIA. Pin: 761008.

Web: [www.nist.edu](http://www.nist.edu)

<b>First Semester</b>					
<b>Theory</b>					
<b>Sl. No</b>	<b>Category</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>L-T-P</b>	<b>Credit</b>
1	BSC	22FY1BS01T/ 22FY1BS02T	Physics/ Chemistry	3-0-0	3
2	BSC	22FY1BS03T	Mathematics-I	3-0-0	3
3	ESC	22FY1ES01T/ 22FY1ES02T	Basic Electrical Engineering/ Basic Electronics Engineering	2-0-0	2
4	ESC	22FY1ES03T/ 22FY1ES04T	Basic Mechanical Engineering/ Basic Civil Engineering	2-0-0	2
5	HSMC	22FY1HS01T	Communicative English	2-0-0	2
6	MC	22FY1MC01T	Student Induction Program/UHV-I (21 Days)		0
<b>Total Credit (Theory)</b>					<b>12</b>
<b>Practical</b>					
1	BSC	22FY1BS01L/ 22FY1BS02L	Physics Laboratory/ Chemistry Laboratory	0-0-2	1
2	ESC	22FY1ES01L/ 22FY1ES02L	Basic Electrical Engineering Laboratory / Basic Electronics Engineering Laboratory	0-0-2	1
3	ESC	22FY1ES03L/ 22FY1ES04L	Basic Mechanical Engineering Laboratory/ Basic Civil Engineering Laboratory	0-0-2	1
4	ESC	22FY1ES05L/ 22FY1ES06L	Engineering Graphics / Workshop Practice	0-0-2	1
5	HSMC	22FY1HS01L	Communicative English Laboratory	0-0-2	1
<b>Total Credit (Practical)</b>					<b>5</b>
<b>Total Semester Credit</b>					<b>17</b>

NOTE: As a part of student induction program, bridge course, club activities and guest lectures will be conducted in regular intervals.



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<b>Subject Code:</b> 22FY1BS01T	<b>Subject Name:</b> Physics	<b>L-T-P:</b> 3-0-0	<b>Credit:</b> 3
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### COURSE OBJECTIVE [COB]:

1. Understand and apply the knowledge to analyze the fundamental physics behind their courses in higher semester.
2. Do project works based on theoretical as well as experimental research.
3. Use the knowledge of Physics for Industrial development.
4. Generate fundamental knowledge needed for the future technological advances that will continue to drive the economic engines of the society.
5. Create an exciting intellectual adventure that inspires young mass and expands the frontiers of their knowledge about Nature.

### Module I: Oscillation & Wave

[6Hrs]

Damped harmonic oscillation: Differential equation of damped vibration and its solution showing Over damped, critical damped and under damped motion, logarithmic decrement, relaxation time.

Forced oscillation: Differential equation of forced damped vibration and its solution, maximum amplitude, velocity, phase of oscillator, resonance, resonance curve, quality factor (only concept).

Wave: Concept of wave and wave equation, reflection and transmission of transverse and longitudinal waves at boundaries (Concepts).

### Module II: Optics

[10 Hrs]

Interference: Bi-prism; Fringe width, wavelength of monochromatic source using Biprism.

Diffraction: Difference between Fresnel's Diffraction and Fraunhofer's diffraction, Fresnel's Half period zone, Fraunhofer's diffraction of Single slit, intensity distribution.

LASER: Spontaneous emission and stimulated emission, Population inversion, Einstein A and B Coefficients, Pumping mechanism, Components of laser system, active medium, Helium-Neon, Ruby Laser and their applications.

Fiber Optics: Structure of optical fiber, Principle of propagation and numerical aperture, Acceptance angle, application of optical fiber.

### Module III: Solid State Physics

[10 Hrs]

Crystalline and Amorphous solid, unit cell, lattice parameter, Miller Indices, Brillouin Zones, Reciprocal Lattice (Only concept), Bragg's law, Classification of materials into metal, semiconductor and insulator in terms of band theory.

Superconductivity: Meissner effect, Critical Magnetic field, Type-I and Type-II Superconductor, Isotope effect, Elementary idea about BCS Theory.

Engineering Nanomaterial: Nano scale and its visualization, Surface to volume ratio, Nano fabrication (Top down and bottom up approach), Carbon Nanotube (Properties and application)

### Module IV: Electromagnetism

[6Hrs]

Gradient, Divergence and curl of Vector Field, Gauss divergence theorem, Stokes theorem (Only statement), Gauss's law of electrostatics in free space and in a medium (Only statement), Faraday's law of electromagnetic induction, Displacement current, Ampere's circuital law, Maxwell's equation in Differential and Integral form, Electromagnetic wave equation in **E** and **B**, Electromagnetic Energy, Poynting theorem and Poynting vector (no derivation).

### Module V: Quantum Physics

[8 Hrs]

Inadequacies in Classical Physics: Blackbody radiation, photoelectric effect, de-Broglie's Hypothesis of matter waves, Compton Scattering, Pair production (no derivation), Uncertainty Principle, and Application of Uncertainty Principle to ground state energy of a harmonic oscillator. Basic features of Quantum Mechanics: Quantum mechanical Wave function, probability density, Normalization of wave function (Simple problem), quantum mechanical operator, Eigen value and Eigen function, expectation value (Simple problem), Schrodinger's time dependent and time independent wave equation and their plane wave solution, Energy Eigen value and Eigen function for a particle in one dimension potential box.

### COURSE OUTCOME [CO]:

1. Memorize the Definitions, statements of physics.
2. Understand and explain different laws of physics governing our physical world.
3. Analyze the theoretical concepts mathematically as well as graphically.
4. Apply and interpret the knowledge to experimental application.

### Text Book:

1. B.B.Swain and P.K.Jena, *Applied Physics for engineering degree students*, 3<sup>rd</sup> edition, Kitab Mahal Publication, NewDelhi.

### Reference Books:

2. Md. M. Khan; S. Panigrahi, *Principle of Engineering Physics Vol. I & Vol. II*, 2<sup>nd</sup> edition, Cambridge Univ. Press, UK.
3. A.S.Vasudeva, *A Text book of Engineering Physics*, 2<sup>nd</sup> edition S. Chand Publication, NewDelhi.
4. A. K. Ghatak, *Optics*, 3<sup>rd</sup> Edition, Tata McGrawHill, NewDelhi.
5. David J. Griffiths, *Introduction to Electrodynamics*, 1<sup>st</sup> edition, PHI Publication, NewDelhi.
6. Arthur Beiser, *Concepts of Modern Physics*, 1<sup>st</sup> edition, McGrawHill Publication, NewDelhi.
7. H.K. Mallik and A. K. Singh, *Engineering Physics*, 1<sup>st</sup> edition, Mc Graw Hill, 2009, NewDelhi.
8. Serway and Jewett, *Physics for Scientists and Engineers*, 10<sup>th</sup> edition, CENGAGE publication, UP.
9. R.K. Puri and V.K. Babber, *Solid state Physics*, S. Chand Publication



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<b>Subject Code:</b> 22FY1BS02T	<b>Subject Name:</b> Chemistry	<b>L-T-P:</b> 3-0-0	<b>Credit:</b> 3
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### COURSE OBJECTIVE [COB]:

1. To understand the basics of quantum mechanical concepts and spectroscopy.
2. To predict the bulk properties and processes using thermodynamic considerations
3. To understand the fundamental concepts on fuels and corrosion chemistry.
4. To know the Basic concepts of electro-chemistry\

#### Module I:

[10 Hrs]

**Quantum Chemistry and Spectroscopy:** Introductory concepts of wave-mechanical model for atom, Electromagnetic radiation, dual nature of matter, Uncertainty principle. Operators in quantum mechanics, Postulates of quantum mechanics, Schrodinger Wave Equation, Particle in a box model (1D), Energy levels.

**Spectroscopy:** Introductory idea on rotational and vibrational spectroscopy: Principle and applications to diatomic molecules. Beer's-Lambert Law: Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, Auxochrome, applications on quantitative analysis. Effect of conjugation on chromophores, solvent effect, Absorption by aromatic systems.

#### Module II:

[8 Hrs]

**The phase rule:** Introduction to free energy and Claussius Clapeyron equation. Statement of Gibb's phase rule(derivation not required) and explanation of the terms involved, Phase diagram of one component system – water and sulfur system, Condensed phase rule, Eutectic system, Phase diagram of two component system –Bi-Cd, and Fe-C system.

#### Module III:

[8 Hrs]

**Fuels:** Classification of fuels, calorific value. (Determination by Dulong's formula), G.C.V. and N.C.V., Solid fuels: Analysis of coal. Liquid fuels: Classification of petroleum, Refining of petroleum, Cracking (Mechanism not required), Knocking in IC engines, Cetane and Octane numbers. Unleaded petrol,

Synthetic petrol, Power alcohol. Gaseous Fuel: Producer gas, Water gas, LPG, CNG. Combustion Calculation.

**Module IV:**

**[8 Hrs]**

**Electrochemistry:** Electrochemical cell, Electrode potential, Reference electrodes (Hydrogen, Calomel), EMF, Relation between EMF and Thermodynamic parameter, Nernst's Equation and its applications: EMF, pH measurement (using Hydrogen and calomel electrode), Solubility product. Concentration cell, Lead storage cell, H<sub>2</sub>-O<sub>2</sub> Fuel cell.

**Module V:**

**[6 Hrs]**

**Corrosion:** Chemical and Electrochemical corrosion, galvanic series, Types of corrosion: Galvanic corrosion, Differential aeration corrosion (Pitting, Crevice water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting corrosion, Corrosion control: metal coatings (Galvanizing and Tinning) Corrosion inhibitors, cathodic protection.

**COURSE OUTCOME [CO]:**

1. Understand the basics of quantum mechanical concepts and spectroscopy.
2. Understand and analyze phase transition and know the conditions of different stable and metastable phase equilibria for both single and binary system.
3. Analyze the quantitative aspects of different kinds of fuel and their combustion and know the properties of different natural and synthetic fuels.
4. To know the basic principles electrochemistry and mechanism of corrosion.

**Text Books:**

- [1] Wiley Engineering Chemistry, Willey publication.
- [2] Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication.

**Reference Books**

- [1] Fundamentals of Molecular Spectroscopy by Banwell, Tata McGraw Hill Education.
- [2] Textbook on Applied Chemistry by A.N. Acharya and B. Samantaray, Pearson
- [3] Introductory to Quantum Chemistry by A. K. Chandra, 4th Ed., Mcgraw Hill.



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- [4] Principles of Physical Chemistry by Puri, Sharma & Pathania, Vishal Publishing Co.
- [5] Engineering Chemistry (NPTEL web-book) by B. L. Tembe, Kamaluddin and M. S. Krishan.
- [6] Engineering Chemistry by Payal B. Joshi and Shashank Deep, Oxford University Press.

<b>Subject Code:</b> <b>22FY1BS03T</b>	<b>Subject Name:</b> <b>Mathematics-I</b>	<b>L-T-P:</b> <b>3-0-0</b>	<b>Credit:</b> <b>3</b>
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### **COURSE OBJECTIVE [COB]:**

1. The objective of the course Mathematics-I is to familiarize the prospective engineers with techniques in Linear algebra, application of calculus, convergent and divergent of sequence and series and use of Fourier series.
2. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.
3. To familiarize the students with vector differential calculus to deal with engineering problems.
4. To develop the problem solving ability of real life problems through vector integral calculus.

#### **Module-I: Systems of Linear Equations, Eigen Values and Eigen Vectors [9 Hrs]**

Matrices and elementary operations; Rank of a matrix by echelon form and normal form; Inverse of matrices (by Gauss-Jordan Method); System of linear equations (by Gauss-Elimination and Gauss-Jordan method); Eigen values and Eigen vectors of a Matrix with their properties.

#### **Module-II: Cayley-Hamilton theorem and Quadratic Forms [8 Hrs]**

Cayley-Hamilton theorem (without proof) and its applications; Finding the inverse and power of a matrix; Symmetric, Skew-symmetric, and orthogonal matrices; Complex matrices: Hermitian, Skew-Hermitian, and Unitary matrices; Similar matrices; Diagonalization of matrices; Quadratic forms and nature of quadratic forms.

#### **Module-III: Fourier Series and Transform [9 Hrs]**

Fourier series; Even and odd function; Fourier series for arbitrary period; Half-range expansion (Sine and Cosine series); Fourier Transforms: Sine and Cosine transforms; Properties; Inverse transforms.

#### **Module-IV: Vector Differential Calculus [6 Hrs]**

Scalar field; Vector field; Vector differential operator; Gradient; Divergent; Laplacian; Curl and their properties; Directional derivatives.

#### **Module-V: Vector Integral Calculus [8 Hrs]**

Line integral; Independence of path; Double integral; Green's theorem in plane (without proof); Surface integrals; Divergence theorem of Gauss (without proof); Stoke's theorem (without proof).

### COURSE OUTCOME [CO]:

On completion of this course, students are able to:

1. Apply the knowledge of matrix to compute eigen values, eigen vectors, solve system of linear equations, inverse of matrices and to understand the use of Cayley-Hamilton theorem.
2. Apply the knowledge of periodic function, Fourier series, and Fourier transformation for analyzing engineering problems.
3. Explore about vector field and the use of vector differential calculus.
4. To analyze and evaluate the multiple integrals and their uses.

### Text Books:

1. E. Kreyszig, *Advanced Engineering Mathematics*, 10<sup>th</sup> Edition, Willey.  
Ch - **7**(7.1 – 7.5, 7.8), **8**(8.1 – 8.5), **9**(9.1 – 9.4, 9.7 – 9.9), **10** (10.1, 10.2, 10.4 – 10.7, 10.9),  
**11**(11.1, 11.2, 11.8, 11.9)

### Reference Books:

1. B. V. Raman, *Higher Engineering Mathematics*, Mc-Graw Hills Education(16<sup>th</sup> reprint)
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publication.
3. D. Datta, *Text Book of Engineering Mathematics*, New Age International Publication.



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<b>Subject Code:</b> 22FY1ES01T	<b>Subject Name:</b> Basic Electrical Engineering	<b>L-T-P:</b> 2-0-0	<b>Credit:</b> 2
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### Course Objectives [COB]:

The main objective of this subject is

1. To provide comprehensive idea about AC and D C circuit analysis.
2. To understand the basic concepts of magnetic circuits, electro-magnetism, and electrostatics.
3. To provide working principles and applications of basic electrical machines in electrical engineering.
4. To provide basic idea about the measuring instruments used in electrical engineering.

### Module- I: DC Circuits

[8 Hours]

Circuit laws: Fundamentals of electric circuit, Ohm's law, Kirchoff's law, series and parallel connections, analysis of circuits using node voltage, mesh current, Thevenin, Maximum power transfer theorem and Norton's theorem to solve simple circuits with dc excitation, star-delta conversion.

**DC transient Analysis:** Transients response analysis in series R-L and R-C circuits with and without DC Excitation.

### Module- II: AC Circuits

[8 Hours]

**Single phase A.C circuit:** Single phase EMF generation, representation of sinusoidal waveforms, average, effective, peak and rms values, j operator, impedance and admittance calculation, rectangular and polar representation of phasors.

**Power in AC circuit:** Real power, reactive power, apparent power, power factor, analysis of single phase ac circuits consisting of R, L,C, RL, RC and RLC combinations (Series and Parallel).

**Module- III: Three Phase AC Circuit:**

**[6 Hours]**

Three phase EMF generation, delta-star and star-delta conversions, and voltage and current relations in star and delta connections. Three phase interconnections: Solution of the three phase circuits with balanced voltage and balanced load conditions, phasor diagram, measurement of power in three phase circuits.

**Module- IV: Basics of Magnetic Circuits and Electrical Machines**

**[10 Hours]**

**Magnetic Circuits:** MMF, flux, reluctance, inductance, review of Ampere's law, Biot Savart's law, magnetic field, B-H characteristics and hysteresis loss, series, and parallel magnetic circuits.

**Transformer:** Construction and Principle of operation of single-phase transformer, EMF equation, Single-phase autotransformer.

**DC Machines:** DC Generator: Construction, Principle of Operation of DC generator, EMF equation, methods of excitation. DC Motor: Back EMF, speed and torque of a DC Motor, Conditions for maximum Power. Speed control of DC shunt motor.

**Three phase Induction Motor:** Construction and principle of operation, types; Slip-torque characteristics.

**Module- V: Measuring Instruments:**

**[6 Hours]**

DC PMMC instruments, Extension of range by shunts and multipliers. Moving iron ammeters and voltmeters, Dynamometer type Watt meters, Induction type Energy Meter.

**Course Outcomes [CO]:**

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

1. Analyze and solve electric and magnetic circuits.
2. Analyze and interpret the sinusoidal electrical quantities and parameters mathematically as well as graphically for 1- phase/3-phase AC circuits.
3. Identify the type of electrical machines for a given application.
4. Identify meters for measuring electrical quantities.

**Text Books:**



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[1] L. S. Bobrow, “Foundations of Electrical Engineering”, Oxford University Press, 2013.

[2] G. Rizzoni, “Principles and Applications of Electrical Engineering”, McGrawHill, 2017.

#### Reference Books:

[1] N. K. De, D. Sarkar, “Basic Electrical Engineering”, University Press, 2016.

[2] Edward Hughes (revised by Ian McKenzie Smith). "Electrical & Electronics Technology"  
Pearson Education Limited. Indian Reprint 2002.

[3] D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

[4] Charles K. Alexander and Matthew N.O. Sadiku, “Fundamentals of Electric Circuits”,  
Mc Graw Hill, Higher Education, Fourth Edition, 2009.

#### Online Resource Materials:

Subject Name	Link	Name of the Instructor
Basic Electrical Technology	<a href="https://nptel.ac.in/courses/108108076">https://nptel.ac.in/courses/108108076</a>	Dr. L.Umanand, Prof. IISC, Bangalore
Basic Electrical Technology	<a href="https://nptel.ac.in/courses/108105053">https://nptel.ac.in/courses/108105053</a>	Prof. N.K.De, Prof. T.K.Bhattacharya, Prof. G.D.Roy, IIT Kharagpur



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<b>Subject Code:</b> 22FY1ES02T	<b>Subject Name:</b> Basic Electronics Engineering	<b>L-T-P:</b> 2-0-0	<b>Credit:</b> 2
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### COURSE OBJECTIVES [COB]:

1. Develop an understanding of the characteristics, operation and applications of pn-junction diode.
2. Comprehend the constructions, operations and characteristics of different transistors.
3. Understand the basics of operational amplifier and its configurations.
4. Acquire the knowledge of basic logic gates and its functional implementation.

#### Module-1

[6 Hours]

Introduction to Semiconductors, Principle of operation of pn-Junction Diodes, V-I characteristics of pn-Junction Diode, Diode Current Equation, AC and DC Resistance of Diode, Equivalent circuit of Diode, Applications of Diode-Clipper and Rectifier circuits.

#### Module-2: Bipolar Junction Transistors (BJTs)

[6 Hours]

Types and Basic Principle of Operation, Modes of Operation and Configurations, Common Emitter Characteristics, Requirement of Biasing, DC Biasing (Fixed bias and Voltage Divider bias), Load line Analysis, Basic characteristics of a voltage amplifier.

#### Module-3: Field Effect Transistors (FETs)

[6 Hours]

Classification of FETs, Operations and characteristics of JFETs and MOSFETs (D-MOSFET and E-MOSFET), Current Equations in FETs.

#### Module -4: Operational Amplifiers (OP-AMP)

[4 Hours]

The Ideal OP-AMP, Voltage transfer characteristic, Virtual ground concept, Inverting and Non-Inverting configurations as amplifiers, Common Mode Rejection Ratio (CMRR).

#### Module-5: Digital Electronic Principles

[5 Hours]

Binary digits, Logic levels, Basic Logic Operations, Laws and Rules of Boolean algebra, Logic Gates - AND, OR, NOT, NAND, NOR, XOR and XNOR gate, De Morgan's theorem, Minterms and Maxterms,

Standard forms of Boolean expressions, Universal properties of NAND and NOR gates, Function implementation using different logic Gates.

### **COURSE OUTCOMES [CO]:**

1. Understand the basic characteristics of semiconductor materials, principle of operation of a p-n junction diode and its use in different circuit design.
2. Understand the construction, operation and characteristics of different types of transistors and learn to solve basic BJT DC circuits.
3. Analyze the basic Operational Amplifier circuits by understanding its characteristics and configuration details.
4. Gain the knowledge of basic logic gates and its functional implementation.

### **TEXT BOOKS:**

1. Robert L. Boylestad, and Louis Nashelsky, *Electronic Devices and Circuit Theory*, 11<sup>th</sup> Edition, Pearson Publication, 2014, New Delhi. (Modules 1, 2, 3 and 4)
2. D Chattopadhyay, P C Rakshit, *Electronics Fundamentals and Applications*, New Age International Publications.
3. M. Morris Mano, and Michael D. Ciletti, *Digital Design*, 5<sup>th</sup> Edition, Pearson Publication, 2016, New Delhi. (Module 5)

### **REFERENCE BOOKS:**

1. Adel S. Sedra, and Kenneth C. Smith, *Microelectronic circuits*, 7<sup>th</sup> Edition, Oxford University Press, 2006, New Delhi.
2. David A. Bell, *Electronic Devices and Circuits*, 5<sup>th</sup> Edition, Oxford University Press, 2010, New Delhi.
3. Thomas L. Floyd, *Digital Fundamentals*, 11<sup>th</sup> Edition, Pearson Publication, 2015, New Delhi.
4. R. P. Jain, *Modern Digital Electronics*, 4<sup>th</sup> Edition, McGraw-Hill Education (India) Pvt Limited, 2012, New Delhi.

### **DIGITAL LEARNING RESOURCES:**



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Course Name	<b>Basic Electronics Engineering</b>
Course Link	<a href="https://nptel.ac.in/courses/117/103/117103063/">https://nptel.ac.in/courses/117/103/117103063/</a>
Course Instructor	Prof. Chitrlekha Mahanta, Department of Electronics and Communication Engineering, IIT Guwahati

Course Name	<b>Basic Electronics Engineering</b>
Course Link	<a href="https://nptel.ac.in/courses/108/101/108101091/">https://nptel.ac.in/courses/108/101/108101091/</a>
Course Instructor	Prof. Mahesh B. Patil, Department of Electrical Engineering, IIT Bombay



<b>Subject Code:</b> 22FY1ES03T	<b>Subject Name:</b> Basic Mechanical Engineering	<b>L-T-P:</b> 2-0-0	<b>Credit:</b> 2
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### COURSE OBJECTIVE [COB]:

1. Define basics of system and fluid.
2. Explain the concept of engineering materials.
3. Describe about various manufacturing process and power transmission system.
4. Understand the robot configuration, structure and basic components.

#### **Module-I: Basics of thermal and fluid science** **[5 Hours]**

System, property, state, process, cycle, internal energy, thermal equilibrium, Zeroth law of thermodynamics, ideal gas equation, fluid properties.

#### **Module-II: Engineering materials** **[5 Hours]**

Selection of engineering material, classification of engineering materials, mechanical properties, introduction to composite material, alloys & plastics.

#### **Module-III: Basic manufacturing process processes** **[5 Hours]**

##### **Basic manufacturing process processes:**

Casting and forming (drawing, forging, extrusion) (working principles with schematic diagram only), joining process (arc welding, riveting).

#### **Module-IV: Power transmission devices** **[5 Hours]**

Belt, rope, gear drives, coupling, brakes (basics, applications, advantages and limitations only).

#### **Module-V: Introduction to robotics and automation** **[8 Hours]**

Overview of a robot, major components of a robot, joints and links, degree of freedom,

specification of a robot, classification of robots by co-ordinate system, present and future application.

Evolution of industry 4.0 and requirement of plant automation, types of plant automation: fixed, programmable and flexible.

### **COURSE OUTCOME [CO]:**

1. Understand basics of system and fluid.
2. Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.
3. Understand mechanism of power transfer through belt, rope, chain and gear drives.
4. Understand the basics concepts of robot.

### **Text Books:**

1. Pravin Kumar, Basic Mechanical Engineering, 2<sup>nd</sup> edition, Pearson Education, 2018, New Delhi.
2. R. Israni, P. K. Shah, N. C. Nayak, Basic Mechanical Engineering, 2<sup>nd</sup> edition, BS Publications, 2019, New Delhi.
3. S. T. Murthy, Text book of Elements of Mechanical Engineering, 3<sup>rd</sup> edition, I. K. International Publishing House Pvt. Limited, 2010, New Delhi

### **Reference Books:**

1. P. Chattopadhaya, Engineering Thermodynamics, 2<sup>nd</sup> edition, Oxford University Press, 2015, New Delhi.
2. P. K. Nag, Engineering Thermodynamics, 4<sup>th</sup> edition, Tata McGraw-Hill Publishing Company, 2008, New Delhi.
3. J. K. Kittur and G. D. Gokak, Elements of Mechanical Engineering, 1<sup>st</sup> edition, Willey, 2015, New Delhi.
4. B. Agrawal, C. M. Agrawal, Basic Mechanical Engineering, 1<sup>st</sup> edition, Willey-India, 2008, New Delhi.



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<b>Subject Code:</b> 22FY1ES04T	<b>Subject Name:</b> Basic Civil Engineering	<b>L-T-P:</b> 2-0-0	<b>Credit:</b> 2
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### COURSE OBJECTIVE [COB]:

1. To understand the properties of common building materials.
2. To understand the concepts of stress and strain of structural members.
3. To learn the fundamentals of soil, highway and irrigation techniques.
4. To learn the various methods of surveying and to understand public water supply system.

### MODULE-I:

[10 hours]

Broad disciplines of Civil Engineering: Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering.

Construction materials: Bricks, qualities of a good brick, classification of bricks. tests on bricks, Cement: Types of cement and their uses, composition of cement, various field and laboratory tests on cement, Ingredients of cement concrete, properties of concrete, grades of concrete, workability of concrete.

Components of building and their basic requirements, building bye laws.

### MODULE-II:

[08 hours]

Structural mechanics: Stress, Strain, Hookes' Law, Stress-Strain diagram, Young's modulus, Bulk modulus, Shear modulus of rigidity, relation between three moduli, Poisson's ratio.

Parallel Forces: Classification of parallel forces, analytical method for the resultant of parallel forces

### MODULE-III:

[08 hours]

Soil mechanics: Origin of soil, types of soil, classification of soil, properties of soil, soil structure  
Types of foundation: shallow and deep with neat sketch

Highway Engineering: modes of transportation, classification of pavements and highways

Irrigation Engineering: fundamentals of irrigation structure and types of irrigation structures.

### MODULE-IV:

[08 hours]

Surveying: Linear measurement and chain survey: use of chains and tapes for measurement of correct length of lines. Prismatic compass, bearing systems and conversions, interior angle calculation, local attraction. Fundamentals of Total Station and GPS

#### MODULE-V:

[06 hours]

Water resources engineering: Necessity and objectives of public water supply schemes; population growth and forecast –estimating the quantity of water required.

Environmental engineering: quality of water, parameters to check quality of water.

#### COURSE OUTCOME [CO]:

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

1. Analyses the properties of building materials and building components.
2. Analyses the concepts of stress and strain of structural members
3. Analyses the fundamentals of type of soil, highway and irrigation methods.
4. Analyses the use of various surveying instruments and mapping and design the water supply system of a town/city.

#### Text Books

1. S. Ramamurtham, Basic Civil Engineering and Engineering Mechanics, Dhanpatrai Publication, 1<sup>st</sup> Edition, 2013
2. M. S. Palanichamy, Basic Civil Engineering, Tata McGraw Hill, 4<sup>th</sup> Edition, 2017

#### Reference Books

1. S. S. Bhavikatti, Basic Civil Engineering, New age international, 2<sup>nd</sup> Edition, 2012
2. S. Gopi, Basic Civil Engineering, Pearson, 1<sup>st</sup> Edition, 2009



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<b>Subject Code:</b> 22FY1HS01T	<b>Subject Name:</b> Communicative English	<b>L-T-P:</b> 2-0-0	<b>Credit:</b> 2
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### COURSE OBJECTIVE [COB]:

1. To communicate effectively by developing competent textual, visual and non-verbal communication abilities.
2. To draft effective formal written business messages in various formats and styles.
3. To learn the skills to effectively deliver formal oral presentations to a variety of audiences in multiple contexts.
4. To be acquainted with the soft skills and various selection procedures adopted by the recruiters.

#### Module-I: Basics of Communication Skills

[8Hrs]

Significance of communication, the process and factors of communication (the communication loop), Difference between General and Technical Communication, Verbal communication and its principles, Non-verbal communication, the importance of audience & purpose.

#### Module-II: Basics of English Pronunciation and Soft Skills

[10Hrs]

Introduction to English pronunciation with the IPA chart, Received Pronunciation, problems of Indian English  
Professional presentations, Group Discussion, Interview etiquette, Leadership skills

#### Module III: Grammar & Vocabulary

[6Hrs]

Parts of speech & Tense, Voice Change, Direct and Indirect Speech, Concord, Parallelism, Word formation- root words, synonyms, antonyms, homonyms & homophones, Common errors in English Grammar

**(N.B. – This unit should be taught by assigning activities to the students in the class)**

#### Module-IV: Basics of Reading and Writing Skills

[6Hrs]

Reading Skill: Types of reading, Sub-skills of reading: Skimming, Scanning, reading comprehension, Writing Skill: Steps to writing, Describing, Defining, Classifying and

Providing examples or evidence, Empathetic and Result Oriented Writing.

**Module-V: Professional Writing:**

**[10Hrs]**

Paragraph, Letter, Memos & Circulars, Reports, Proposals, e-mails & CV

**COURSE OUTCOME [CO]:**

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

1. Become adept in their use of the spoken word in interpersonal communication, small group interaction and public speaking.
2. Use an appropriate style and format to write letters (formal and informal), prepare result-oriented reports, prepare CVs and draft business documents.
3. Gather and prepare information and apply it to persuade or articulate one's own point of view clearly and efficiently.
4. Comprehend the employability market, identify the organizations to get good placements and broaden career plans by developing all-round personality.

**Text Books:**

1. Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press
2. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
3. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw –Hill.
4. Business Communication, Meenakshi Raman & Prakash Singh, Oxford
5. Communication for Management, Urmila Rai and S M Rai, HPH
6. Business and Managerial Communication, Sengupta, PHI
7. Business Communication for Managers, P. Mehra, Pearson
8. Soft Skills K Alex, S Chand

**Reference Books:**

1. Manual of English Grammar and Composition. J.C. Nesfield Forgotten Books
2. Practical English Usage. Michael Swan. OUP.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
4. A Course in English phonetics by T.R. KANSAKAR, ORIENT LONGMEN Press.
5. A Communicative Grammar of English, Leech, Geoffrey & Jan Svartvik Longman



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<b>Subject Code:</b> 22FY1MC01T	<b>Subject Name:</b> Universal Human Value [UHV-I]	<b>L-T-P:</b> 2-0-0	<b>Credit:</b> 0
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**COURSE OBJECTIVE [COB]:**

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

**MODULE-I: Course Introduction – Need, Basic Guidelines, Content and Process for Value Education**

Chapter1- Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration–what is it? – Its content and process; ‘Natural Acceptance’ and ,Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for, Fulfillment of aspirations of every human being with their correct priority  
 Chapter2- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

**MODULE-II: Understanding Harmony in the Human Being – Harmony in Myself!**

Chapter3- Human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’  
 Understanding the needs of Self (‘I’) and ‘Body’ – happiness and physical facility. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer). Understanding the characteristics and activities of ‘I’ and harmony in ‘I’ .

Chapter4-Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods

available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

### **MODULE-III: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship**

Chapter5-Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.

Understanding the harmony in the society (society being an extension of family):Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society, Universal Orderfrom family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

### **MODULE-IV: Understanding Harmony in the Nature and Existence – Whole existence as Coexistence**

Chapter6:Understanding the harmony in the Nature Interconnectedness and mutual fulfillment among the four orders of naturerecyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.

### **MODULE-IV: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

Chapter7: Natural acceptance of human values, Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

### **CORUSE OUTCOME [CO]:**

1. Students are expected to become more aware of themselves, and their surroundings• (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability
3. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society)

4. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

#### Text Books:

1. R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

#### Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantik, 1999.
2. A. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi “The Story of My Experiments with Truth”
5. . Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”
6. India Wins Freedom – Maulana Abdul Kalam Azad
7. Vivekananda – Romain Rolland(English)



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<b>Subject Code:</b> 22FY1BS01L	<b>Subject Name:</b> Physics Laboratory	<b>L-T-P:</b> 0-0-2	<b>Credit:</b> 1
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### COURSE OBJECTIVE [COB]:

1. Co-relate the theory with experiment.
2. Group project works based on as experimental physics knowledge
3. Create an exciting intellectual adventure with experimental skill.

**A student is expected to perform ten experiments form the list given below.**

1. Determination of Young's modulus by Searle's method.
2. Determination of Rigidity modulus by static method.
3. Determination of surface tension by capillary rise method.
4. Determination of acceleration due to gravity by Bar pendulum.
5. Determination of wave length of light by Newton's ring apparatus.
6. Determination of wavelength of laser source by diffraction grating method.
7. Determination of grating element of a grating plate.
8. Plotting of characteristic curve of a PN junction diode.
9. Plotting of characteristic curves of BJT.
10. Study of Hall Effect.
11. Study of RC circuit.
12. Determination of unknown resistance using Meter Bridge.
13. Energy gap determination by Four-Probe method.
14. Determination of Young's modulus by bending of beams.
15. Verification of laws of vibration of string using sonometer.

### COURSE OUTCOME [CO]:

1. Learn basics of measuring instruments and its expt. Applications.
2. Observe and evaluate hands on skill on experimental physics.

### Books:

1. Engineering practical Physics by S. panigrahi and B. Mallick. Cengage Learning
2. B.B.Swain ,*A Complete Course in Practical Physics*,1<sup>st</sup> edition, Kalyani Publication
3. C L. Arora , *Practical Physics*, S.Chand Publication.



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<b>Subject Code:</b> 22FY1BS02L	<b>Subject Name:</b> Chemistry Laboratory	<b>L-T-P:</b> 0-0-2	<b>Credit:</b> 1
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#### COURSE OBJECTIVE [COB]:

1. To understand the water quality parameter
2. Quantitative analysis of some standard compound
3. Instrumental methods for quantitative analysis

#### Experiments (for all branches):

1. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
2. Determination of partition coefficients of iodine between toluene and water.
3. Determination of percentage of available chlorine in a sample of bleaching powder.
4. Determination of dissolved oxygen in a sample of water.
5. Determination of strength of acids in a mixture using pH meter.
6. Determination of total hardness of water by EDTA method.
7. Determination of strength of colored substance using colorimeter.
8. Determination of strength of acids in a mixture using Conductance Bridge.
9. Determination of surface tension of given sample using Stalagnometer
10. Determination of Viscosity of a supplied sample(s) by Ostwald's Viscometer.
11. Determination molecular weight of polymer by viscosity method.
12. Determination of rate constant of acid catalyzed ester hydrolysis.
13. Determination of Flash point of given oil by Pensky-Marten's flash point apparatus.
14. Determination of critical solution temperature of Phenol-Water system.
15. Determination of Calorific value of a fuel using Bomb calorimeter.

#### COURSE OUTCOME [CO]:

1. Analyze the water quality parameter including dissolved oxygen, Hardness, and chlorine content.
2. Analyze qualitatively different compounds using analytical equipments like, pH meter, Conductivity meter, Colorimeter etc.



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Qualitative analysis of liquid sample through viscosity and surface tension measurement

**Suggested Books:**

1. Laboratory manual on Engineering Chemistry, S.K. Bhasin, Sudha Rani, Dhanpat Rai Publishing company.
2. Experiments in Applied Chemistry By Dr. Sunita Ratan, S.K. Kataria and sons.



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<b>Subject Code:</b> 22FY1ES01L	<b>Subject Name:</b> Basic Electrical Engineering Laboratory	<b>L-T-P:</b> 0-0-2	<b>Credit:</b> 1
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### **COURSE OBJECTIVE [COB]:**

The main objective of this subject is

1. To enhance understanding of electrical engineering circuit analysis concepts including: Thevenin's theorem, Norton's theorem, Superposition Theorem.
2. To get the knowledge of phasor representation, power and power factor measurement of electrical circuit.
3. To know the concept of B-H Curve of the magnetic materials and to know the functionality of the transformer with their losses by conducting suitable tests on it.
4. To Apply knowledge of DC generators and motors in various applications and able to know the uses of starter.

### **List of Experiment**

1. V-I Characteristics of Incandescent (Filament) Lamp.
2. Voltage and Power measurement of a Fluorescent Lamp.
3. Verification of DC Network Theorems (Superposition, Thevenin's & Norton's Theorem).
4. Calculation of current, voltage and power in series R-L-C circuit excited by single phase AC supply and calculation of power factor.
5. Measurement of power and power factor in a three phase AC circuit by using Two-Wattmeter method.
6. Connection and testing of a Single-Phase Energy Meter.
7. Open Circuit and short circuit Test on Single phase Transformer.
8. Starting and Speed Control of a D.C. Shunt Motor.
9. Study of B-H curve by using CRO.

### **COURSE OUTCOME [CO]:**

After completion of the course, the student will be able to

1. Determine the DC network analysis with the use of theorems and their applicability for the practical application.
2. Know the fundamentals magnetic field theory, able to apply the laws of magnetic field for the transformer and also determination of its losses by conducting suitable tests.
3. Understand the concept of Phasor representation and Power factor measurement of AC circuit.
4. Analyze the performance of D.C machines and its various practical applications.



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<b>Subject Code:</b> 22FY1ES02L	<b>Subject Name:</b> Basic Electronics Engineering Laboratory	<b>L-T-P:</b> 0-0-2	<b>Credit:</b> 1
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### COURSE OBJECTIVE [COB]:

1. Understand the measurement techniques using basic measuring instruments.
2. Testing of various electronics components and analyzing its characteristics.
3. Assemble and test different circuits using diode, BJT and op-amps.
4. Verify the truth table of basic logic gates

### List of Experiments

(Any ten Experiments out of 12 should be performed)

1. Study of digital multi-meters, CROs and function generators.
2. Familiarization and testing of different electronic components (Active & Passive).
3. Study of the V-I characteristics of P-N junction diode and calculation of DC & AC resistance.
4. Construction of half-wave rectifier with & without capacitive Filter and verify the output waveforms using CRO and calculation of efficiency and ripple factor.
5. Constructions of full wave rectifier circuits with & without capacitive Filter and verify the output waveforms using CRO and calculation of efficiency and ripple factor.
6. Construction of positive and negative clipper circuits and study of their output waveforms by CRO.
7. Study of both input and output V-I characteristics of a Common Emitter configuration.
8. Construction of BJT voltage divider bias circuits and determination of Q-point and  $\beta_{DC}$ .
9. Study of output V-I characteristics of an n-channel JFET and define the pinch off voltage from it.
10. Design of inverting and non-inverting amplifiers using Op-Amp and compare the theoretical and practical gain values.
11. Truth table verification of logic gates.
12. Verification of universal properties of NAND and NOR gates.

### COURSE OUTCOME [CO]:

1. Identify and test basic electronics components using test and measuring instruments.



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2. Design, assemble and test of diode and transistor circuits.
3. Design and testing of op-amp based configurations.
4. Familiarization and testing of basic logic gates.

<b>Subject Code:</b> <b>22FY1ES03L</b>	<b>Subject Name:</b> <b>Basic Mechanical Engineering Laboratory</b>	<b>L-T-P:</b> <b>0-0-2</b>	<b>Credit:</b> <b>1</b>
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**COURSE OBJECTIVE [COB]:**

- 1 To understand basic working principle of power plant, IC engine and. refrigerator
- 2 To study various parts in Automobile
- 3 To give complete knowledge about power transmission.
- 4 To study the measurement of the fluid characteristics

**List of Experiments:**

- 1 Model study of Fire Tube Boilers and Water Tube Boilers.
- 2 Model study of Two stroke I.C. Engine.
- 3 Model study of Four stroke I.C. Engine.
- 4 Model study of Refrigerator
- 5 Model study of Water Turbines.
- 6 Model study of Water pumps.
- 7 Study of Gears and Gear trains.
- 8 Verification of Bernoulli's Theorem and its application to Venturimeter.
- 9 Calibration of Bourdon Tube Pressure gauge and measurement of pressure using manometers.
- 10 Model study of Automobile Parts.
- 11 Determination of velocity ratio of belt drive
- 12 Study of Aristo 6-axis Robot

**COURSE OUTCOME [CO]:**

- 1 Understand basics of thermodynamics and components of a thermal power plant

- 2 Understand basics of refrigeration, air conditioners and internal combustion engines.
- 3 Understand mechanism of power transfer through belt, rope, chain and gear drives.
- 4 Understand the measurement of pressure and energy.

<b>Subject Code:</b>	<b>Subject Name:</b>	<b>L-T-P:</b>	<b>Credit:</b>
<b>22FY1ES04L</b>	<b>Basic Civil Engineering Laboratory</b>	<b>0-0-2</b>	<b>1</b>

**COURSE OBJECTIVE [COB]:**

1. To know the properties of brick
2. To know the properties of cement and concrete
3. To know the support reaction of different types of beam and properties of soil
4. To know the use of various tests performed in surveying

**List of Experiments:**

5. To determine the shape, size and compressive strength test of brick.
6. To determine the consistency of cement.
7. To find out the setting time of cement.
8. To find out the workability of concrete by Slump test.
9. To determine the compressive strength of concrete cubes (nominal mix).
10. Calculate the support reactions of a simply supported beam and overhanging beam
11. To classify the soil using mechanical sieve analysis.
12. To classify the soil based on liquid limit and Plastic limit.
13. A) To perform chain correction for erroneous length and measure the true distance between two survey stations. B) To measure the bearing of a line using prismatic compass
14. To know the basic components of Total Station

**COURSE OUTCOME [CO]:**

1. To analyze the properties of brick
2. To analyze the properties of cement and concrete
3. To analyze the support reaction of different types of beam and properties of soil
4. To analyze the various tests performed in surveying



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<b>Subject Code:</b> 22FY1ES05L	<b>Subject Name:</b> Engineering Graphics	<b>L-T-P:</b> 0-0-2	<b>Credit:</b> 1
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### **COURSE OBJECTIVE [COB]:**

1. The fundamentals of engineering drawing and its application.
2. Skills in Reading and Interpretation of Engineering Drawings.
3. Understand about various types of projections and draw orthographic projections of points, lines, planes and solid.
4. Understanding the basic commands and tools necessary for drawing using Auto-CAD

**Introduction:** Drawing Instruments and their uses, BIS conventions, dimensioning line conventions.

### **Orthographic Projections:**

Introduction, Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes.

**[Two Sheets]**

### **Orthographic Projections of Plane Surfaces (First Angle Projection Only)**

Introduction, projections of plane surfaces, triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

**[One Sheets]**

### **Projections of Solids (First Angle Projection Only)**

Introduction, Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

**[One Sheets]**

### **AUTO CAD Drawings:**

Introduction, layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. **[Two Sheets]**

### **Sections and Development of Lateral Surfaces of Solids**

Introduction, Section planes, Sections, Section views, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **[One Sheets]**

### **Isometric Projection (Using Isometric Scale Only)**

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres.

**[One Sheets]**

### **Course Outcomes:**

1. Understand the importance of bis and iso standards in engineering drafting and create geometric constructions; drawing parallel and perpendicular lines, and to construct circles, arcs, tangential, and irregular curves
2. Analyze and draw the orthographic projections of points, lines, planes, solids and sectional solids.
3. Create 3-d computer drawing: use industry-standard computer aided design (cad) software to model solid objects proceeding from basic sketching techniques to the creation of solid features through the use of extrusions, cuts, rotations, patterns and sweeps.

4. Create dimensions: apply good dimensioning practice, by considering convenient type of dimensioning at correct location.

**Text Books:**

1. N. D. Bhatt, Engineering Drawing, 53<sup>rd</sup> edition, Charoter Publishing House, 2019, Anand, Gujrat.
2. B. Agrawal and C. M. Agrawal, Engineering Drawing, 3<sup>rd</sup> edition, Tata McGraw-Hill Publishing Company Limited, 2019.

**References Books:**

1. T. E. French, C. J. Vierck, R. J. Foster, Engineering. Drawing and Graphic Technology, 14<sup>th</sup> Revised edition, Mc Graw-Hill International, 1993.
2. W. J. Luzadder and J. M. Duff, Fundamentals of Engineering Drawing, 11<sup>th</sup> edition, Prentice- Hall India, New Delhi, 1992.
3. A. J. Dhananjay, Engineering drawing, 1<sup>st</sup> edition, Tata McGraw Hill, 2017.
4. M. B. Shah and B. C. Rana, Engineering Drawing, 2<sup>nd</sup> edition, Pearson Education, 2009, New Delhi



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<b>Subject Code:</b> 22FY1ES06L	<b>Subject Name:</b> Workshop Practice	<b>L-T-P:</b> 0-0-2	<b>Credit:</b> 1
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### **COURSE OBJECTIVE [COB]:**

1. Acquire knowledge of possible personal and general safety hazards in industrial settings and their mitigation techniques.
2. Learn about different mechanical tools used in engineering.
3. Learn about organization of machines and tools for a safe and effective workplace.
4. Machining and joining techniques of commonly used engineering materials.

### **List of Experiments:**

#### **Fitting Practice:**

1. Use of hand tools in fitting.
2. Making a paper weight of mild steel.

#### **Welding Practice:**

1. Electric arc and gas welding practice: making a t-joint or l joint

#### **Machining Practice:**

1. Face turning, plane turning and step turning in lathe machine.
2. Making a rectangular slot in shaper machine
3. Making a key way in milling machine

### **COURSE OUTCOME:**

1. Identify safety signs and act accordingly, maintain personal as well as group and equipment safety.
2. Identify different tools and their applications.
3. Undertake minor fabrication and repair/maintenance work using commonly available tools and materials.



#### **Text Books:**



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1. S. K. Hajra Choudhary, A. K. Hajra Choudhary and Nirjhar Roy, Elements of Workshop Technology, Vol. I, Media Promoters, 2018.
2. S. K. Hajra Choudhary and Nirjhar Roy, Elements Of Workshop Technology Vol 2 Machine Tools, Indian Book Distributing Co. Calcutta, 2010.
3. W. A. J. Chapman, Workshop Technology Part 1, 5<sup>th</sup> edition, Cambridge University Press, 2001.
4. W. A. J. Chapman, Workshop Technology Part 2, 4<sup>th</sup> edition, Cambridge University Press, 1972.
5. P. Kannaiah, K. L. Narayana, Workshop manual, Scitech publications (india) Pvt. Ltd., 2005, Chennai

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<b>Subject Code:</b> <b>22FY1HS01L</b>	<b>Subject Name:</b> <b>Communicative English Laboratory</b>	<b>L-T-P:</b> <b>0-0-2</b>	<b>Credit:</b> <b>1</b>

**This unit involves practice sessions in the Communicative English Laboratory**

1. Listening Comprehension
2. Pronunciation, Intonation
3. Stress and Rhythm practice
4. Common Everyday Situations: Conversations and Dialogues
5. Formal Presentations
6. Reading Comprehension
7. Report writing
8. Writing letters, e-mails,
9. Writing essay, CV
10. Statement of Purpose
11. Grammar activities
12. Empathetic Listening

## Bridge Course: Mathematics

### COURSE OBJECTIVE [COB]:

To create interest among the students in Mathematics. To bridge the gap between the subject they have studied in intermediate level and the upper level.

### Module-I: Set Theory, Relation, and Function [3 hrs]

Set theory: Definition and representation, Types of sets, Operation on sets.

Relation: Definition, Types of relations, Partial order and equivalence relations.

Function: Definition and its classification, Types of functions, Composition and inverse of functions.

### Module-II: Differential and Integral Calculus [3 hrs]

Basic concepts about limit, continuity, differentiability, and integration.

### Module-III: Matrices and Determinants [3 hrs]

Types of matrices, operation on matrices, Determinant and cofactor, Inverse of a square matrix, Rank of matrix, Elementary row and column operations, System of linear equations.

### Module-IV: Complex Numbers [3 hrs]

Definition of complex numbers, Algebra of complex numbers, Absolute value, Conjugate, Complex functions, Domain, Region, Geometrical representation of complex numbers.

### Module-V: Differential Equations [3 hrs]

Order and Degree of differential equation, Formulation of differential equation, Linear differential equation and reducible to linear form, Exact and Integrating factor, IVP of first order

### Module-VI: Probability [3 hrs]

Sample Space, Events, Counting sample points, Probability of an event, Additive Rules, Conditional Probability, Multiplicative rules, Baye's Rule

### Module – VII: Modeling [3hrs]

Application of Mathematics in Mathematical modeling for various engineering problems (for example, radio activity, fluid flow, heat flow, electrical circuits, growth and decay problems, wave propagation, spring balance system, etc.).

### Test Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Willey.



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## Bridge Course: Physics

**Module-I:** Needs of Physics for Engineering, concept on unit and dimension, different types of units, Different laws for mechanics (Hook's law, Newton's law of motion)

**Module-II:** Concepts of motion, concepts of oscillation, different types of oscillation (In details with practical examples), harmonic oscillation, concepts of period, equation establishment concept.

**Module-III:** What is frequency? Types of frequency, units, Co-ordinate concept, different types co-ordinates, scalar & vector (in details)

**Module-IV:** Arithmetic of scalar and vector & vector and vector (Addition, subtraction, and multiplication), Basic calculus, vector calculus, concepts on mathematical operator & vector operator.



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## Bridge Course: Chemistry

**Module-I:** Atomic Structure & Bonding: Introduction to Atomic models, Failure of Classical mechanics de Broglie's eqn.(concept of matter wave, problems), Heisenberg's uncertainty principle. Schroedinger's eqn, normalization, orthogonalisation, eigen function & eigen value, modern concept of atomic Structure.

**Module-II:** Molecular Orbital Theory (MOT): LCAO theory, MOT for homonuclear diatomic species MOT for heteronuclear diatomic species, Metallic bonding.