Course Structure & Syllabus for

1st year

(2025 Admission batch)

B.Tech Programme

Common to All Branches

Affiliated to BPUT Odisha

1st Year Course Structure

First Semester

Theory

Sl. No.	Category	Course Code	Course Title	L-T-P	Credit
1	BS	BT-T-BS101	Engineering Mathematics I	3-0-0	3
2	BS	BT-T-BS102/ BT-T-BS103	Engineering Physics / Engineering Chemistry	3-0-0	3
3	ES	BT-T-ES101 / BT-T-ES102	Basic Electrical Engg. / Basic Electronics Engg.	3-0-0	3
4	HS	BT-T-HS101	Functional English	2-0-0	2
5	ES	BT-T-ES103	Programming for Problem Solving using C	3-0-0	3
				Total Credit (Theory)	**14**

Practical

1	BS	BT-P-BS101 / BT-P-BS102	Engineering Physics Lab / Engineering Chemistry Lab	0-0-2	1
2	ES	BT-P-ES101 / BT-P-ES102	Basic Electrical Engg. Lab / Basic Electronics Engg. Lab	0-0-2	1
3	ES	BT-P-ES105 / BT-P-ES104	Engineering Graphics & Design Lab / Workshop Practices	0-0-2	2
4	HS	BT-P-HS101	Functional English Lab	0-0-2	1
5	ES	BT-P-ES103	Programming for Problem Solving using C Lab	0-0-2	1
6	MC	BT-P-MC101	Induction Training 21 days		0
				Total Credit (Practical)	6
				Total Semester Credit	**20**

Second Semester

Theory

Sl. No.	Category	Course Code	Course Title	L-T-P	Credit
1	BS	BT-T-BS204	Engineering Mathematics II	3-0-0	3
2	BS	BT-T-BS202 / BT-T-BS203	Engineering Physics / Engineering Chemistry	3-0-0	3
3	ES	BT-T-ES201 / BT-T-ES202	Basic Electrical Engg. / Basic Electronics Engg.	3-0-0	3
4	HS	BT-T-HS202	Universal Human Value	3-0-0	2
5	ES	BT-T-ES204	Basics of Civil & Mechanical Engineering	3-0-0	3
6	ES	BT-T-ES205	OOPs using Java	3-0-0	3
7	MC	BT-T-MC201	Environmental Science		0
				Total Credit (Theory)	**17**

Practical

1	BS	BT-P-BS201 / BT-P-BS202	Engineering Physics Lab / Engineering Chemistry Lab	0-0-2	1
2	ES	BT-P-ES201 / BT-P-ES202	Basic Electrical Engg. Lab / Basic Electronics Engg. Lab	0-0-2	1
3	ES	BT-P-ES205 / BT-P-ES204	Engineering Graphics & Design Lab / Workshop Practices	0-0-2	2
4	HS	BT-P-HS202	Business Communication and Life Skill Lab		1
5	ES	BT-P-ES206	OOPs Using Java Lab	0-0-2	1
6	MC	BT-P-MC202	NSS / NCC / Yoga		0
				Total Credit (Practical)	6
				Total Semester Credit	**23**

1st Semester	BT-T-BS101	Engineering Mathematics-I (Calculus and Linear Algebra)	L-T-P 3-0-0	Credit 3

Prerequisite

Function, Limit of a function, Continuity of function, Differentiation, Integration. Matrices & Determinant.

Course Objectives:

The goal of the course Mathematics-I is to

- Familiarize the importance of calculus associated with one variable, sequence and series for all branch of engineering.
- Analyze engineering problems by applying vector and integral calculus.
- Apply the knowledge of Linear Algebra to solve the system of equations.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module 1: Basic Calculus (8 Lectures)

Basic idea of Continuity and differentiability of functions of single variable, Statements of Rolle's theorem and Mean value theorem with applications.

Introduction to improper integrals, Beta and Gamma functions with properties.

Module 2: Vector Differential Calculus(8Lectures)

Vector and scalar point functions and fields, gradient of a scalar field, directional derivative, divergence and curl of a vector field with applications.

Module3: Vector Integral Calculus (8 Lectures)

Line integrals of scalar and vector valued functions, double integrals, change of order, Green's theorem Gauss Divergence theorem and Stoke's theorem (statement only) with simple applications.

Module 4:* Linear Algebra*(8 Lectures)

Linear systems of equations, Elementary row operations, Gauss elimination, linear independence, rank of a matrix, Gauss-Jordan elimination. Vector space, subspace, basis and dimension.

Module 5:* Linear Algebra*(8 Lectures)

Eigenvalues, eigenvectors, Caley Hamilton theorem (statement only) with basic applications, symmetric, skew-symmetric and orthogonal matrices, diagonalization, quadratic forms, complex matrices and forms.

Text Books:

1. Advanced Engineering Mathematics by E. Kreyszig, 10th Edition, Wiley.
2. Calculus and Analytic geometry by G.B. Thomas and R.L. Finney, 9th Edition, Pearson, 2002.
3. Introduction to Linear Algebra, by Gilbert Strang, 5th Edition, 2016.

Reference Books:

1. Higher Engineering Mathematics by B. V. Raman, McGraw Hills Education.
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication.
3. An Introduction to Linear Algebra by V. Krishnamurthy, V.P. Mainra, J.L.Arora, East West Press pvt ltd.

Web links and Video Lectures (e-Resources):

http://nptel.ac.in/courses.php?disciplineID=111
http://www.class-central.com/subject/math(MOOCs)
http://academicearth.org

COURSE OUTCOME

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

CO 1	Apply Differential and Integral Calculus and evaluate improper integrals using correct mathematical limit notation. Apart from these applications they will have a basic understanding of Beta and Gamma Functions
CO 2	Acquire knowledge of vector differential calculus and their application in engineering subjects.
CO 3	Acquire knowledge of vector integral calculus and their application in engineering subjects.
CO 4	Classify linear Independence and linear dependence of vectors and explain the concepts of rank, basis and dimension of vector Space, in addition of this, also learn to solve system of liner equations.
CO 5	Apply essential tool to solve numerical problems based on Eigen values, Eigen vectors, diagonalization and orthogonalization with the help of linear algebra. Also deal with various properties of Eigen values which are used to solve many complex problems in various branches of engineering. In addition to that aware with the concept of norm of a vector, orthonormal, orthogonal vectors, quadratic forms and complex matrices.

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1st & 2nd Semester	BT-T-BS102/ BT-T-BS202	ENGINEERING PHYSICS	L-T-P 3-0-0	Credit 3

Prerequisite

Basic knowledge on intermediate Physics including mechanics, modern Physics, optics, wave motion, electricity and magnetism. Evaluation Scheme

Course Objectives:

The objective of this course is to attract the students towards detail understanding of concepts, fundamentals and applications of Physics enriching engineering and its emerging branches. It makes students conceive new ideas to have theoretical and experimental knowledge to be applied in academics, designs and research.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module I

OSCILLATIONS & WAVES: (08 HOURS)

Simple Harmonic Oscillation: velocity of motion, acceleration, time period, frequency, phase; damped harmonic oscillation: Differential equation of damped vibration, logarithmic decrement, Forced harmonic oscillation, resonance, coupled oscillation, normal frequencies, In- phase and out-Phase Oscillation, Concept of waves and wave equation, Velocity of transverse vibration in a stretched string. Superposition principle

Module II

WAVE OPTICS: (08 HOURS)

Concept of interference, two sources interference pattern, Young's double slit expt., Fringe width, Newton's ring, Expression of wavelength and refractive index. Diffraction: Huygen's principle, Fresnel's Diffraction and Fraunhoffer's diffraction, Brief idea of Fraunhoffer's diffraction in Single slit, intensity distribution

Module III

LASER and FIBRE OPTICS : (08 HOURS)

Atomic excitation and energy states, Absorption, spontaneous emission and stimulated emission, Population inversion, Pumping mechanisms: optical pumping, Electrical Pumping, Components of laser system, active medium, population inversion, Ruby laser, Helium-Neon laser (basic concepts, energy level diagram and Engineering application only) Structure of optical fibre, Principle of propagation and numerical aperture, Acceptance angle, classification of optical fibre : SI and GI , FOCL (Fiber Optic Communication Link)

SUPERCONDUCTORS:(03 HOURS)

Zero electrical resistivity, characteristics, magnetic properties and Meissner's effect, type-1 and type -2 superconductors and applications.

Module IV

ELECTROMAGNETISM: (06 HOURS)

(Student will be familiarized with some basic used in vector calculus prior to Development of Maxwell's electromagnetic wave equations. No proof of theorems and laws included in this unit expected- statement and interpretation should suffice) Introduction; Scalar & vector fields, Gradient Of Scalar Field, divergence and curl of Vector Field, Gauss divergence theorem, Stokes theorem (Only Statements, no proof), Gauss's law of electrostatics in free space and in a medium (Only statements), Faraday's law of electromagnetic induction (Only statements), Displacement current, Ampere's circuital law, Maxwell's equation in Differential and Integral form, Electromagnetic wave equation in E and B,

Module V

QUANTUM PHYSICS: (08 HOURS)

Elementary concepts of quantum physics formulation to deal with physical systems. Need for Quantum physics- historical overviews (For concept), de Broglie matter waves, Compton Scattering, Pair production (no derivation), Uncertainty Principle, Application of Uncertainty Principle, Non-existence of electrons in the Nucleus, Ground state energy of a harmonic oscillator. Basic Features of Quantum Mechanics: Transition from deterministic to Probabilistic state ,Wave function, probability density, Normalization of wave function (Simple problem), operators, expectation values (Simple problem), Schrodinger equation-Time dependent and time independent equations.

Applications of quantum mechanics: Free Particle, Particle in 1D box.

Text Books:

1. Engineering Physics by D.R. Joshi, Mc Graw Hill
2. Principle of Physics Vol. I & Vol. II by Md. M. Khan & S. Panigrahi (Cambridge Univ. Press).
3. Engineering Physics by D.K. Bhattacharrya and Poom Tondon , Oxford University Press

Reference Books:

1. Optics - A. K. Ghatak
2. Introduction to Electrodynamics - David J. Griffiths, PHI Publication
3. Concepts of Modern Physics – Arthur Beiser.
4. Physics-I for engineering degree students - B.B. Swain and P.K.Jena.

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/115/106/115106119/
https://nptel.ac.in/courses/122/106/122106034/
https://nptel.ac.in/courses/115/105/115105099/

COURSE OUTCOME

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

CO 1	Learn vibrations and oscillatory systems. It helps in understanding multiple oscillatory systems and complex oscillations. It adds in developing ideas of wave propagation and superposition principle
CO 2	Know the benefits the understanding of light and its wave nature in different experimental demonstration of interference. Diffraction in solids will help in dealing with XRD and structure of materials.
CO 3	Make a clarity of making out crystal structures and crystallography to learn about different materials and characteristics of solids.
CO 4	Different LASER'S like Ruby, He-Ne and S.C. Lasers will help to develop multiple ideas of its application. Principle of optical fibres will help to know new generation optical fibres in communication systems.
CO 5	Gain some fundamental knowledge about electromagnetism. It will familiarize with some basic used in vector calculus prior to development of Maxwell's electromagnetic wave equations.
CO 6	Deal with elementary concepts of quantum physics formulation with physical systems and to gain knowledge on applied quantum physics.

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1st & 2nd Semester	BT-P-BS101 / BT-P-BS201	ENGINEERING PHYSICS LAB	L-T-P 0-0-2	Credit 1

OBJECTIVES:

To make students engage in learning the experimental aspects of Physics with hands-on experience in precision measurements, experiments of optics, electronics and mechanics.

Evaluation Scheme

Experiment (work) Planning and execution	Results and interpretation	Report	Viva-voce to experiment	Total
20	30	30	20	100

DETAILS SYLLABUS OF ENGINEERING PHYSICS LABORATORY

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

Text Books:

1. Engineering Practical Physics, by S.Panigrahi and B. Mallick

Reference Books :

Course Outcomes:

Upon completion of the subject, students will be able to.

CO 1	Know the accuracy and precision in measurement.
CO 2	know how to calculate Young's modulus, rigidity modulus of a wire and to understand the concept of vibration mechanism.
CO 3	Determine the surface tension of liquid and to understand fluid properties.
CO 4	To experiment with wave nature of light in diffraction through a grating.
CO 5	To know the variation of I ~V of PN junction and BJT.
CO 6	To determine the wavelength of light using Newton's ring.

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1st & 2nd Semester	BT-T-BS103 / BT-T-BS203	ENGINEERING CHEMISTRY	L-T-P 3-0-0	Credit 3

Prerequisite

Basic knowledge on intermediate chemistry including Electro Chemistry, Combustion, Thermodynamics of Fuels, Elementary idea about Spectroscopy and nanomaerials along with some basics of applications of chemistry in day today life.

Course Objectives:

1. The purpose of the course is to impart knowledge on the fundamental concepts of chemistry involved in application of several important engineering materials that are used in the industry/day-to-day life.
2. The course aims to impart the basic understanding about the chemical behavior of fuels, alloy systems, corrosion, instrumental method of analysis and nano materials.
3. It also aims to develop selection of ideal engineering materials and its application in suitable engineering field.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module-1

Energy Sciences:

(A) Types of fuels, Calorific value, Determination of Calorific value by using Dulong's formula, Combustion and its calculations, Solid fuel: Coal analysis (Proximate and ultimate analysis),Elementary ideas on some gaseous fuels(Natural gas, ,LPG), Liquid fuels: IC - engine fuel, concept of knocking, anti knocking, octane number and cetane number, Fractional Distillation of petroleum, introductory idea about Cracking of heavy oils.

(B) Battery Technology: Fundamentals of primary and secondary cells, Rechargeable Batteries; Lead acid storage batteries, Lithium ion battery, Fuel cells (H2-O2 Cell) [10 hrs]

Module-2

Phase rule & Alloys

Statement of Gibb's phase rule and explanation of the terms involved, Advantages and limitations of phase rule, Phase diagram of one component system – water and sulpur system, Condensed phase rule, Phase diagram of two component system – Eutectic system: Bi-Cd, Pb-Tin system. [6hrs.]

Module-3

Corrosion and its Control

Definition and scope of corrosion, Dry and wet corrosion; Direct chemical corrosion, Electrochemical corrosion and its mechanisms; Types of electro chemical corrosion, (differential aeration, galvanic, & concentration cell Corrosion); Typical Electrochemical corrosion like Pitting, Waterline; Factors affecting corrosion, Protection against corrosion : Modifying the environment, Use of Inhibitors, Cathodic Protection: Sacrificial anode method, Impressed current Cathodic protection. Anodic & cathodic coating. [8hrs]

Module-4

Instrumental Techniques:

Spectroscopy: Selection rule, Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, Auxochrome. Effect of conjugation on chromophores, , Basic Principles and application ofrotational and vibrational Spectroscopy ,selection rule of UV-visible, vibrational and rotational spectroscopy. [7Hrs]

Module-5

Nanomaterials

Introduction, Top-down and Bottom-up approach, Classification of Nano-materials on dimensions(1D, 2D, 3D and0D), Characteristic, properties & application: Carbon nanotube , Nanowire, Application of Nanomaterial: Catalysis, Medicine, Bionanomaterials. [5Hrs]

Text Books:

1. TextBookinAppliedChemistrybyA. N. Acharya and B.Samantaray,PearsonIndia.
2. EngineeringChemistry,JainandJain,DhanpatRaiPublication.ReferenceBooks:
3. TextbookofnanoscienceandNanotechnology,McGrawHillEducation(India)Pvt.Ltd.,2012.
4. FundamentalsofMolecularSpectroscopybyBanwell,TataMcGrawHillEducation.
5. QuantumChemistrybyIraN.Levine, Pearson7thEdition.
6. MolecularSpectroscopy,IraN.Levine,JohnWileyandSons

Reference Books:

1. S.Chawla, Engineering Chemistry, Dhanpat Rai &Co.
2. S.K.BhasinandS.Rani, EngineeringChemistry,3rdEdition,DhanpatRai&Co, 2012.
3. IntroductorytoQuantumChemistrybyA.K.Chandra.,4thEdition,McgrawHillEducation.
4. InorganicChemistrybyDonaldA.Tarr,GaryMiessler,PearsonIndia,ThirdEdition.
5. EngineeringChemistry(NPTELweb-book)byB.L.Tembe, KamaluddinandM. S. Krishan.

Web links and Video Lectures (e-Resources):

1. https://www.metrohm.com/en/industries/petro-lubricants/: Lubricant analysis according tointernationalstandards
2. http://www.eco-web.com/edi/01759.html:EfficientWastewaterTreatment:Thefieldforanalyticalandmonitoring

COURSE OUTCOME

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

CO 1	Classify various fuels based on combustion parameters and understand the working principle of various batteries.
CO 2	To understand the microstructure of a given alloy systems and eutectic systems under agiven set of conditions
CO 3	Utilizetheknowledgeofelectrochemistryandcorrosionscienceinpreventingengineering equipments from corrosion.
CO 4	Apply the concept of molecular spectroscopy to analyze organic compounds using spectrophotometer
CO 5	Discuss the benefits and applications of nano materials.
CO 6	Compare and contrast the chemical behavior and physical properties of common substance

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1st & 2nd Semester	BT-P-BS102 / BT-P-BS202	ENGINEERING CHEMISTRY LAB	L-T-P 0-0-2	Credit 1

OBJECTIVES:

In this laboratory the engineering students are provided with the basic practical knowledge on Analysis of Portable & waste water, sample ore analysis, characterisation of lubricating oils, introducing the students to some theoretical topics through instrumental method of analysis such as PH measurement, Viscocity and flash point measurement &weight measurement.

PRE-REQUISITES

Student should have the knowledge of balancing equations, principle of titrations, titrant, titrand, preparation of standard solutions, concentration of a solution, indicators used in a titration, principle of reduction-oxidation reactions, handling of instruments like pH meter & accurate measurement of sample by using electronic balance

Teaching Scheme

Regular laboratory experiments conducted under supervision of the teacher. Demonstration will be given for each experiment.

Evaluation Scheme

Experiment (work) Planning and execution	Results and interpretation	Report	Viva-voce to experiment	Total
20	30	30	20	100

DETAILS SYLLABUS OF ENGINEERING PHYSICS LABORATORY

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

1. Estimation of calcium in limestone powder
2. Determination of dissolved oxygen in supplied water.
3. Determination of Total hardness of water sample by EDTA method
4. Determination of alkalinity of water.
5. Determination of available chlorine of bleaching powder/residual chlorine in tap water
6. Determination of Flash-point/fire point of a lubricant by Pensky-Martein's apparatus.
7. Determination of kinematic viscosity and Viscosity Index of a lubricant by Redwood viscometer.
8. Standardization of KMnO4 using sodium oxalate.
9. Determination of Ferrous ion in a given sample of Mohr,s salt
10. Determination of the partition coefficient of a substance between two immiscible liquids.
11. Determination of Acid value of oil.
12. Determination of concentration of a colour substance by Spectrophotometer
13. Green synthesis of noble metal/oxide based nanoparticles

14. Determination of the partition coefficient of a substance between two immiscible liquids.
15. Proximate analysis of coal sample.
16. Determination of iodine value of oil/fat.

Text Books:

T1. Jain & Jain, Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Company, 2015.
T2. S. S. Dara, Engineering Chemistry, 12th Edition, S. Chand Publisher, 2014.

Reference Books :

R1. S. Chawla, Essentials of Experimental Engineering Chemistry, Dhanpat Rai & Co.
R2. S. K. Bhasin and S. Rani, Laboratory Manual on Engineering Chemistry, 3rd Edition, Dhanpat Rai & Co, 2012.

Course Outcomes:

1. https://www.metrohm.com/en/industries/petro-lubricants/: Lubricant analysis according to international standards
2. http://www.eco-web.com/edi/01759.html: Efficient Wastewater Treatment: The field for analytical and monitoring

CO 1	Learn and apply basic techniques used in chemistry laboratory for small/large scale water analyses/purification
CO 2	Be able estimate the ions/metal ions present in domestic/industry waste water.
CO 3	Utilize the fundamental laboratory techniques for analyses such as titrations, separation/purification and spectroscopy.
CO 4	Able to analyze and gain experimental skill.
CO 5	Test the quality of an oil/fat by measuring its iodine or acid value by means of amount of unsaturation for various industrial use.
CO 6	Verify quality of a lubricant by means of its viscocity or flash point which gives their nature & flammability for various industrial applications

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1st & 3rd Semester	BT-T-ES102 / BT-T-ES202	BASIC ELECTRONICS ENGINEERING	L-T-P 3-0-0	Credit 3

Prerequisite

Course Objectives:

The goal of the course Basic Electronics is to

- To understand the efficacy of Electronic principles which are pervasive in engineering applications.
- To provide a comprehensive understanding of electronic devices and circuits
- To familiarize with different electronic components (Diode, Transistor, FET, OP-AMP etc.).
- It will build a mathematical and numerical background for design and analyze of electronic circuits.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module 1:(10 Lectures)

Fundamentals of Electric Circuits:

Charge & current, Voltage & current sources, Electrical circuit elements (R, L and C) and their characteristics, Kirchhoff's current and voltage laws; Star-Delta Conversion, Current Division and Voltage Division, Resistive Network Analysis: Node voltage & Mesh current analysis, Thevenin's Theorem, Norton's Theorem, Principle of superposition. Maximum power transfer theorem

Module 1:(10 Lectures)

PN Junction Diode, Working Principle of Diodes, V-I characteristics of junction diode, AC and DC Resistance of Diode, Diode Current Equation, Temp effect on characteristics of diode, Equivalent circuit of Diode, Breakdown Mechanism, Zener diode and applications, Rectifier circuit, Clipper and Clamper Circuit.

Module 2: (10 Lectures)

Bipolar Junction Transistor: Transistor Operation, Current Equation in transistors, CB, CE, CC Configurations and their Characteristics, Load line Analysis, DC Biasing(fixed bias, emitter stabilized bias circuit, voltage divider bias ,DC bias with collector feedback)

Module3: (6 Lectures)

Field Effect Transistor (FET): Construction, Characteristics of Junction FET (JFET), Depletion and Enhancement type Metal Oxide Semiconductor FET (MOSFET), Introduction to Complementary MOS (CMOS) circuits.
Feedback Amplifiers: Principle, Types, Advantages and Disadvantages of Feedback, Different Negative Feedback Topologies. Oscillators –Barkhaunsen criteria for oscillation.

Module-4(6 Hours)
Introduction to OPAMP, characteristics of OPAMP, Equivalent circuit of OPAMP ,CMRR, Virtual ground concept, Basic OPAMP configuration(inverting, non-inverting, differential OPAMP, Instrumentation OPAMP

Module-5(8 Hours)
Digital Electronic Principles: Number System, Number System Conversion, Binary arithmetic, Complement arithmetic Logic Gates, Realization of different gates using NAND and NOR gates. Boolean
algebra – Laws and Rules, De Morgan's theorem, Standard forms of Boolean expressions, minterm, Maxterm Realization of Boolean expressions using AOI logic and NAND /NOR logic.

Text Books:
1. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education.
2. S. Sedra and K. C. Smith, Microelectronic Circuits, 7th Edition, Oxford University Press.
3. Microprocessors and Interfacing, Programming & Hardware - Douglas V. Hall, McGraw Hill Education Pvt Ltd., 3rd edition.

Reference Books:
1. Agarwal and J. Lang, Foundations of Analog and Digital Electronic Circuits, 1st Edition, Morgan Kaufmann, 2005.
2. V. K. Mehta and Rohit Mehta, Principles of Electronics, 3rd Edition, S. Chand Publishing, 1980.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/122106025

COURSE OUTCOME
Upon Completion of the subject the students will demonstrate the ability to:

CO 1	Familiarize with different semiconductor device with their applications
CO 2	Familiarize with different types of transistors with their configurations
CO 3	Idea about the different feedback circuits
CO 4	Familiarize with JFET, MOSFET, MOS with their applications
CO 5	Familiarize with OPAMP with their applications
CO 6	Knowledge about number systems, basic Gates and logical expression.

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1st & 2nd Semester	BT-P-ES102 / BT-P-ES202	BASIC ELECTRONICS ENGINEERING LAB	L-T-P 0-0-2	Credit 1

Prerequisite

Knowledge on intrinsic and extrinsic semiconductors, Physics and Chemistry of Higher Secondary Science level.

Course Objectives:

The goal of the Basic Electronics Lab is to

- Know broadly the concepts and functionalities of the electronic devices, tools and instruments.
- Understand general specifications and deploy ability of the electronic devices, and Assembles.
- Develop confidence in handling and usage of electronic devices, tools and instruments in engineering applications.

Evaluation Scheme

Experiment (work) Planning and execution	Results and interpretation	Report	Viva-voce to experiment	Total
20	30	30	20	100

Assignment/Experiment

1. Familiarization of electronic components and devices (Testing of semiconductor diodes and transistors using digital multi-meter).
2. Study and use of Oscilloscope, signal generator to view waveforms and measure amplitude and frequency of a given waveform.
3. V-I characteristics of semiconductor diode and determining its DC and AC resistances.
4. Study of half-wave and full-wave rectifier circuits without and with capacitor filter; recording of the waveforms and measurement of average and rms values of the rectified output.
5. Implementation of clipper circuits, both positive clipper and negative clipper. Observe its output waveforms and compare them with theoretical analyzed results.
6. Study of static characteristics of BJT in CE configuration.
7. DC biasing() of the transistor in CE configuration and determination of its operating point.
8. Studies on logic gates truth table verification of various gates, implementation of EXNOR.
9. Design of ALL GATES USING NAND,NOR
10. Studies on Op-Amp applications (Inverting, non inverting, integrating differentiating configurations) recording of the input-output waveforms.
11. Implementation of clamper circuits. Observe its output waveforms and compare them with theoretical analyzed results

12. Design HALF,FULL ADDER CIRCUIT

Text Books:

1. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education.
2. A. S. Sedra and K. C. Smith, Microelectronic Circuits, 7th Edition, Oxford University Press. Reference Books:
3. V. K. Mehta and R. Mehta, Principles of Electronics, 3rd Edition, S.Chand Publishing, 1980.

Online Resources:

Course Outcomes

At the end of this course, the students will be able to:

CO 1	Familiarize with various electronic components, measuring instruments
CO 2	Acquire knowledge of characteristics of diodes and design, testing
CO 3	Implementation of Diode in various applications RECTIFIER & CLIPPER
CO 4	Acquire knowledge of characteristics of transistors and design testing & implementation of transistors in various applications
CO 5	Develop understanding of digital logic gates and design & test digital circuits for various applications using logic gates
CO 6	Gain understanding of operational amplifiers (Op-Amp) and design & testing of electronic circuits for various applications using Op-Amp.

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1st & 2nd Semester	BT-T-ES101 / BT-T-ES201	BASIC ELECTRICAL ENGINEERING	L-T-P 3-0-0	Credit 3

PRE-REQUISITE:
Basic knowledge of intermediate Physics, knowledge of basic Mathematics such as Calculus, Ordinary Differential Equations, Matrices etc.

OBJECTIVE:

- To provide an understanding of basics of Electricity and Magnetism.
- The course will cover the basics of DC & AC networks, principle of operation of different electrical machines.
- It gives a firsthand information to all on electrical appliances, their safety and precautions.
- It gives an application specific knowledge to all to be conversant with industry and gives an overall knowledge on earthing of all appliances.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

DETAILED SYLLABUS:

Module – 1
Fundamentals of Electric Circuits: Charge & current, Voltage & current sources, Electrical circuit elements (R, L and C) and their characteristics, Kirchhoff's current and voltage laws; Star-Delta Conversion, Current Division and Voltage Division, Resistive Network Analysis: Node voltage & Mesh current analysis, ,Thevenin's Theorem, Norton's Theorem, Principle of superposition. Maximum power transfer theorem

Module - 2
AC Circuits: Complex Algebra, Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series and parallel).

Module - 3
Three Phase AC:Three phase balanced circuits, Comparison between single phase and three phase circuits, voltage and current relations in star and delta connections.
Power measurement by wattmeter method, Brief introduction to generation, Transmission and Distribution of electrical power, Earthing & electrical safety, Personal safety measures: Electric Shock, Safety Precautions to avoid shock.

Module – 4

Magnetic Circuits: MMF, flux, reluctance, magnetic circuit and magnetic reluctance, Magnetic materials, BH characteristics and Hysteresis loss, Series and parallel magnetic circuits. Ideal and practical transformer, e.m.f. equation of transformer, Equivalent circuit, open circuit and short circuit test(no problem),Auto-transformer.5

Module – 5

Electrical Machines

Construction and principle of operation of DC machines (Generator and Motor),emf equation. Types of DC Generators and Motors, Back emf , applications. synchronous generator (construction and principle of operation)

Brief idea about Induction Motors (construction and principle of operation), slip, Torque-slip characteristics.

Text Books:

1. G.Rizzoni, Principles and Applications of Electrical Engineering, 5th Edition, McGraw Hill, 2006

2. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.

3. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison WelseyLongman Inc., 1995

Reference Books:

1.B. L. Theraja and A. K. Theraja, Textbook of Electrical Technology (Vol-I), 23rd Edition, S. Chand & Co. Ltd., 2002.

2.J.B. Gupta, “Fundamentals of Electrical Engineering and Electronics” S.K. Kataria & Sons Publications, 2002

3. Electrical Engineering Fundamentals, Vincent Del Toro, 2nd Edition, PHI

4. Fundamentals of Electric Circuits By Charls K Alexander, Mathew N O Sadiku, 3rd Edition, TMH

ONLINE RESOURSES

1 https://nptel.ac.in/courses/108/105/108105053/

2 https://nptel.ac.in/courses/108/108/108108076/

COURSE OUTCOMES

Upon Completion of the subject the students will demonstrate the ability to:

CO 1	Implement principles of DC network, theorems and fundamental concepts of electric circuit.
CO 2	Analyze the concept of single phase AC circuit, Phasor relationship and correlate AC power.
CO 3	Analyze and implement the concept of three phase power generation, three phase interconnections , three phase power and its measurement.
CO 4	Express significance of magnetic circuits, applications, importance of magnetic losses in electrical machines, principles and applications of power transformers and auto transformers.

CO 5	Apply basic principles of DC machines and their applications, concept of Induction machines.

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1st & 2nd Semester	BT-P-ES101 / BT-P-ES201	BASIC ELECTRICAL ENGINEERING LAB	L-T-P 0-0-2	Credit 1

PRE-REQUISITE:
Basic knowledge of intermediate Physics, knowledge of electricity and magnetism.

OBJECTIVES:
To make students engage in learning the experimental aspects of Physics with hands-on experience in precision measurements, experiments of optics, electronics and mechanics. A student is expected to perform ten experiments form the list given below.

Evaluation Scheme

Experiment (work) Planning and execution	Results and interpretation	Report	Viva-voce to experiment	Total
20	30	30	20	100

Name of Experiments

1. Verification of theorems (Norton, Thevenin, Superposition).
2. Connection and measurement of power consumption of a fluorescent lamp.
3. Power and phase measurements in three phase system by two wattmeter method.
4. V-I characteristics of incandescent lamps and time-fusing current characteristics of a fuse.
5. Connection and testing of a single-phase energy meter.
6. Calculation of current, voltage and power in series R-L-C circuit excited by single-phase AC supply and calculation of power factor.
7. Calculation of no load losses of a single-phase transformer.
8. Measurement of Field and Armature Resistance of a DC Shunt Motor.
9. Study of House wiring.
10. Study of Electrical Safety Rules and Electrical Tariff (Electric Bill).
11. Measurements of earth resistance by megger.
12. Study of AC & DC Distribution panel board.

Text Books:

Web Link :

- www.vlab.co.in
- http://vlabs.iitkgp.ernet.in/

Course Outcomes:

Upon Completion of this lab. the students will demonstrate the ability to:

CO1	Implement principles of DC network, theorems and fundamental concepts of Ohm's law.
CO2	Analyze the concept of single phase AC circuit, measurement of power and power factor.
CO3	Analyze and implement the concept of three phase power and its measurement.
CO4	Express significance of magnetic circuits, applications, importance of magnetic losses in electrical machines, principles and applications of power transformers and auto transformers, and DC machines.
CO5	Apply basic safety rules and electrical tariff.

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1st & 2nd Semester	BT-P-ES104 / BT-P-ES204	WORKSHOP PRACTICES	L-T-P 0-0-2	Credit 2

Pre-Requisite:
Basic Knowledge about units & dimensions, Mathematics and physics.

Objective:
This course aims to provide a good platform to engineering students of all branches to equip them with knowledge, skill and attitude that enable them to perform basic workshop tasks. Workshop Practice lab deals with different processes by which component of machines or equipments are made.

Evaluation Scheme

Quality of Job	Understanding of the job and related theory	Quality of report and viva voice	Total
50	30	20	100

A student is expected to perform minimum eight jobs form the list given below.

FITTING PRACTICE

1. Use of hand tools in fitting, preparing a male female joint of M.S. or making a paper weight of Mild steel.
   A. Design and fabrication of "Hexagonal paper weight" using MS plate.
   B. Design and fabrication of "Electrical panel box" by using aluminum sheet metal.

WELDING PRACTICE

2. Welding practice (Basic Theory to be explained prior to practice):
   A. Gas welding & Electric Arc welding practice through Lap joint, Butt Joint, T- joint, Corner joint & Edge joint.
   B. Design & fabrication of rack or any other furniture by using MS material.

MACHINING PRACTICE

3. Machining (Basic Theory to be explained prior to practice):
   A. Hand practice on Turning, Facing, Tapper Turning, Grooving, Knurling, Threading, Gear cutting, Shaping, Grinding & Drilling by using Lathe, Milling, Shaper, Grinding & Drilling Machines.
   B. Design & fabrication of mandrel using above machine tools

PROJECT WORK

A project to be carried out by using the advanced machineries such as CNC router, CNC bending, LASER cutting, CNC cutting and 3D printing.

Text Books:

1. Elements of Workshop Technology by Hajra Chaudhury -Volume-I & Volume II : MPP publishers.

Reference Books:

A course in Workshop Technology by B S Raghuwanshi: Dhanpat Ray & Co.
A Text book of Workshop Technology by R S Khurmi & J K Gupta: S Chand & Co Ltd.
Workshop Technology Part- I by W Chapman: Taylor & Francis group.

On-line References:

Course Outcomes:

Upon completion of the subject the students will be able to

CO1	Understand the appropriate tools, materials, instruments required for specific operation in workshop.
CO2	Apply techniques to perform different operations with hand and machine tools such as: lathe, drilling, shaper and grinding machines using given job drawing.
CO3	Understand the dimensions and figures of the hand tools used in fitting, welding shop and machine tools such as: lathe and Milling Machines.
CO4	Prepare a report related to hand tools and machine tools, description referring to Text books and lab manuals.
CO5	Understand the working procedures and perform various tasks in CNC Machines.

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1st & 2nd Semester	BT-P-ES105 / BT-P-ES205	ENGINEERING GRAPHICS & DESIGN Lab	L-T-P 0-0-2	Credit 2

Pre-Requisite:
Basic knowledge of intermediate Physics that includes, states of matter, units, vector laws, mechanics, law of conservation of mass and energy and intermediate Mathematics that includes calculus, trigonometry.

Objective:
To have the knowledge of interpretation of dimensions of different quadrant projections.
To understand the basic principles of engineering drawing.
To have the knowledge of generating the pictorial views.
To understand the development of surface

Teaching Scheme:
Regular laboratory experiments to be conducted under the supervision of teachers and demonstrators with the help of ICT, as and when required along with pre-lab session and demonstration for each experiment.

Evaluation Scheme

Quality of Job	Understanding of the job and related theory	Quality of report and viva voice	Total
50	30	20	100

DETAIL SYLLABUS
A student is expected to perform the experiments in AutoCAD from the list given below.

1. Sheet Lay-out & Sketching, Line Drawing, Lettering & Dimensioning.
2. Concept of Orthographic Projection, First-angle Projection, Projections of Points
3. Projection of straight line
4. Projection of planes
5. Projection of Solids.
6. Sectional Views of solids
7. Development of surfaces
8. Isometric Projection
9. Intersection of surfaces

Text Books
1. Engineering Drawing by N.D.Bhatt & V.M.Panchal, Charotar publishing House, Anand
2. Engineering Drawing with an Introduction to AutoCAD by Dhanjay A. Johle, Tata McGraw Hill

Reference Books.
1. Text Book on Engineering Drawing by Narayana / Kannaiah, Scitech.

2. Engineering Drawing by Shah and Rana, Pearson Education
3. Engineering Drawing and Graphics using AutoCAD by T.Jeyapoovan, Vikas Publishing
4. Engineering Drawing and Graphics by K.Venugopal, New Age International.

COURSE OUTCOMES

On completion of this course, the students will be able to,

CO1. Prepare and understand drawings.

CO2. Use the principles of orthographic projections.

CO3. By studying about projections of solids students will be able to visualize three dimensional objects and that will enable them to design new products.

CO4. Design and fabricate surfaces of different shapes

CO5.Represent the objects in three dimensional appearances

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1st Semester	BT-T-HS101	FUNCTIONAL ENGLISH	L-T-P 2-0-0	Credit 2

Pre-Requisites
Basic knowledge of intermediate English grammar, Vocabulary and Sub-skills of English i.e. Reading, Writing, Listening and Speaking.

Course Objectives
This subject aims to:

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively by the application of the theoretical and practical components of the English syllabus.
- Develop communication skills in formal and informal situations.
- To help students in improving their presentation skills to enhance their employability.

Teaching Scheme
Regular classroom lectures and doubt clearing, interactive sessions are planned to focus on problem solving activities.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Detailed Syllabus
Module-1 (10 Hours)
1.1 Writing Process : Paragraph writing, Summarizing, Precis writing. The concept of Central Idea is discussed. Developing points to make a paragraph is discussed. Navigating from one paragraph to other is practiced. Writing sample paragraphs, summarizing and Précis-writing after reading a short story is practiced.
1.2 Essay: Concept of essay writing and types of essay is discussed. Practicing and evaluating essays are done in class. Students are required to write essays on current affair topics.
1.3 Notice: Students are taught how to write notices. Notice making is practiced in class.
1.4 Email: Students are taught how to write emails. Email writing is practiced in class.
1.5 Formal Letter: Students are taught how to write formal letters. Letter writing is practiced in class.

Text Books:
1. The Submerged Valley and Other Stories by Manoj Das
2. Real Writing with Readings by Susan Anker
3. Barron's Essays

Link: https://ebin.pub/the-submerged-valley-and-other-stories.htm

Module-2 (8 Hours)

Reading kills

2.1 Process of Reading, Global and Local Comprehension, sub-skills of reading skimming, scanning, inference, guessing word-meaning, using appropriate speed for various kinds of reading.

2.2 Correction of Reading faults of eye-fixation, regression, finger-pointing, sub- vocalising, Reading aloud, and indiscriminate use of the dictionary. The module will familiarize students with reading short stories, comprehending unknown passages and articles which will enable them to understand the nuances of reading and comprehension.

Reading -Short Stories:

1.The Tiger in the Tunnel, Ruskin Bond
2.Remember the Roses, Avery Taylor
3.The Monkey's Paw, W. W. Jacobs
4.The Gift of the Magi, O. Henry
5.The Bicycle, Dash Benhur

Additional Reading :

https://pdfroom.com/books/malgudi-days-narayan-r-k/or5WWqZn5qD
https://www.press.umich.edu/9441812/building_academic_reading_skills_book_1_2nd_edition/?s=look_inside
https://www.jmu.edu/valleyscholars/files/studyreadingskills.pdf
https://files.eric.ed.gov/fulltext/ED583494.pdf

Assessing Reading by Vivien Berry
e-resource: www.britishcouncil.org/exam/aptis/research/assessment-literacy

Module-3 (10 Hours)

Grammar in Usage

The student will get a better understanding of the nuances and application of grammar and vocabulary in day-to-day usage.

3.1. Use of Quantifiers and Articles: (Much, Many, a lot of, few, a few, little, a little, too much, too many, articles – a, an, and the, places where articles are not used)

3.2. Tense Pattern: (Simple and Progressive, simple and perfect, perfect and perfect progressive, Progressive and Perfect Progressive, Future time reference)

3.3. Active and Passive Voice
3.4 Prepositions
3.5 Transformation of Sentences

Text Books:

1. Oxford modern English Grammar
2. Destination B1 Grammar and Vocabulary with Answer Key (Malcolm Mann & Steve Taylore-Knowles)
3. English vocabulary in use (Michael McCarthy)

Link:

https://pdfroom.com/books/oxford-modern-englishgrammar/KRd6oO79gZp/download

Recommended Books:

1. Remedial English Grammar by F. T. Wood, Macmillan.
2. Essential English Grammar by Raymond Murphy, Cambridge University Press
3. The Visual Element in Language Teaching (Education Today Series) (ELT) by Pit Corder
4. English Grammar and Composition-Wren and Martin

Module-4 (8 Hours)

The Sounds of English

4.1 Consonant and Vowel Sounds
4.2 The International Phonetic Alphabet (IPA)
4.3 Problem sounds
4.4 Stress Patterns:Syllable ,Stress and Intonation

Text Books:

1. A Textbook of English Phonetics for Indian Students by T. Balasubramanian, Macmillan
2. A Course in English Phonetics by T.R. Kansakar, Orient Longman
3. Phonetics for Dummies by William F. Katz
4. Spoken English: A Manual of Speech and Phonetics by R.K.Bansal, J. B. Harrison, Orient Blackman.

Module-5 (4 Hours)

Professional Workplace Communication

5.1 CV Writing-Designing a CV.Self-analysis and developing an understanding of concepts like hobbies, achievements, interests, co-curricular activities etc.

Text books:

"Resumes for Dummies" by Laura DeCarlo.For Dummies.

1. "The Damn Good Resume Guide, Fifth Edition: A Crash Course in Resume Writing" by Yana Parker and Beth Brown,Ten Speed Press
2. "The 7 Second CV" How to Land the Interview by James Reed,Virgin Books

Text Books

1. Malgudi Days by R.K Narayan
2. The Submerged Valley and Other Stories by Manoj Das
3. Real Writing with Readings by Susan Anker
4. Oxford modern English Grammar
5. Destination B1 Grammar and Vocabulary with Answer Key (Malcolm Mann & Steve TayloreKnowles)
6. English vocabulary in use (Michael MC Carthy)

Reference Books

1. Remedial English Grammar by F. T. Wood, Macmillan.
2. Essential English Grammar By Raymond Murphy, Cambridge University Press
3. The Visual Element in Language Teaching (Education Today Series) (ELT) by PIT CORDER
4. Introducing Applied Linguistics (Penguin modern linguistics texts) by S. Pit Corder
5. Advanced Grammar in Use with Answers, MARTIN HEWINGS
6. Phonetics For Dummies by William F. Katz

Online Resources

- https://pdfroom.com/books/malgudi-days-narayan-r-k/or5WWqZn5qD
- https://www.press.umich.edu/9441812/building_academic_reading_skills_book_1_2nd_edition/?s=look_inside
- https://www.jmu.edu/valleyscholars/files/studyreadingskills.pdf
- https://files.eric.ed.gov/fulltext/ED583494.pdf
- https://ebin.pub/the-submerged-valley-and-other-stories.htm
- https://salahlibrary.files.wordpress.com/2017/03/a-practical-introduction-to-phonetics.pdf
- https://bbooks.info/b/w/ef588b4a0491ac5e37669efa7c0d5476f92a872f/phonetics-for-dummies.pdf
- https://salahlibrary.files.wordpress.com/2018/10/d8b4d986d8a7d8aed8aa_d8a2d988d8a7.pdf
- https://pdfroom.com/books/oxford-modern-english-grammar/KRd6oO79gZp/download

COURSE OUTCOMES

Course Outcomes: At the end of this course, the students will be able to:

CO 1	Use English Language effectively in written form.
CO 2	Read texts from a variety of different genre, use information to demonstrate understanding and read to develop critical thinking skills.
CO 3	Application of grammar to communicate effectively.
CO 4	Acquire basic proficiency in listening and pronunciation, developing confidence and enhancing communication
CO 5	Crafting and customizing a CV to attract the attention of potential employers and enhancing employability.

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1st Semester	BT-P-HS101	FUNCTIONAL ENGLISH LAB	L-T-P 0-0-2	Credit 1

Course Objectives :
The goal of the Basic Electronics Lab is to

- Know broadly the concepts and functionalities of the electronic devices, tools and instruments.
- Understand general specifications and deploy ability of the electronic devices, and Assembles.
- Develop confidence in handling and usage of electronic devices, tools and instruments in engineering applications.

Pre-Requisites :
Knowledge on intrinsic and extrinsic semiconductors, Physics and Chemistry of Higher Secondary Science level.

Teaching Scheme :
Regular laboratory experiments conducted under supervision of the teacher. Demonstration will be given for each experiment.

Evaluation Scheme

Experiment (work) Planning and execution	Results and interpretation	Report	Viva-voce to experiment	Total
20	30	30	20	100

Assignment/Experiment
At least 10 Experiments

1 "Find The Word" Reading Aloud Activity (Pair Work); "Reading Aloud" Task (Pair Work / Small Group Work); "Team Reading Aloud" – Pronunciation Reading (Whole Group); Key Word Bingo – Vocabulary Based Reading Activity (Individual)
2 True or False? – Post-Reading Activity (Alone); Summarise The Text – Post Reading Activity (Individual); Re-write The Text – Reading Activity (Alone); Walking Text – Reading Comprehension Activity (Individual)
3 "Filminute: One-minute films in different languages on different topics, can watch without sound too! - IDEAS FOR USE:
    1. Watch film clip and describe in detail what happened;
    2. Watch film clip and summarise;
    3. Watch film clip and extend the story;
    4. Listen to film clip without watching and imagine what the film is about and describe it."
4 Picture interpretation: interpreting a given image and making a short presentation about the same.
5 News Paper Article Analysis - (General Topics): Provide A Newspaper Article And Ask Students To Comprehend And Analyse And Then make a Presentation on it.
6 Movie Talk Google Docs Database: Hundreds of short video clips and adverts with links and short descriptions of the clip content on a Google Doc. Most are French, Spanish, silent or with music only.

7 Digital Collage designing and presentation- students will design a collage in group based on a particular theme and will present it.
8 Ppt-ask students to watch a web series of their choice. Give them few areas like Screenplay, Characterisation, Plot construction and ask them to make a power point presentation on it.
9 Listening test: provide an audio clip and questions on it. Ask students to answer after listening to the audio. (Cambridge Assessment English content)
10 "Creative writing: students will be given a cue to write a short story."
11 Grammar and Vocabulary Test

Text Books:

1. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education.
2. A. S. Sedra and K. C. Smith, Microelectronic Circuits, 7th Edition, Oxford University Press. Reference Books:
3. V. K. Mehta and R. Mehta, Principles of Electronics, 3rd Edition, S.Chand Publishing, 1980.

Online Resources:

Course Outcomes

At the end of this course, the students will be able to:

CO 1	Understanding the sounds of English and using them in the right context.
CO 2	Write paragraphs, stories etc. using short and crisp sentences.
CO 3	Listen, speak, read & write the sounds of English using correct stress, tone and rhythm.
CO 4	Language Skills- Grammar Exercises, Jumbled Sentences & correcting errors.
CO 5	Writing- Paragraph & Precis Writing.
CO 6	Role-Play- enacting ideas, themes(short duration & one-on-one activity)
CO 7	Critical Appreciation - Article Analysis
CO 8	Introducing Self & Others- Learning the nuances of Introduction, Asking questions and Overcoming stage fright.

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1st Semester	BT-T-ES103	PROGRAMMING FOR PROBLEM SOLVING USING C	L-T-P 3-0-0	Credit 3

Pre-requisites:
Computer fundamentals, Number System, Basic mathematical background.

Course objectives:
The course aims to provide exposure to problem-solving through programming. It aims to train the student to the basic concepts of the C-programming language. This course involves a lab component which is designed to give the students hands-on experience with the concepts.

- To understand the various steps in program development.
- To understand the basic concepts in C programming language.
- To learn to write programs (using structured programming approach) in C to solve problems.
- Learn relation of memory and memory referencing with the program execution
- To introduce the students to basic data structures such as arrays and linked lists.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module-1

Foundations of C Programming **(8 hours)**

Problem solving techniques: Algorithm, flow chart, Pseudo-code, program, Simple examples.
Fundamentals of Computing: Components of a computer system, Computer Languages, Creating and running programs, Program Development, steps of program execution. Compiler and interpreter.
Basics of C programming: Structure of a C program. Character set, Identifiers, Keywords, Data Types, Constants and Variables, Input-output statements, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Comments

Module -2

Control Structures and Array **(10 hours)**

Decision making: Conditional statements (if, if-else, nested if, else if ladder, switch, break statement, goto) and their use in decision-making.
Iterative statements: Looping structures (for, while, do-while) and their applications in repetitive tasks. The break and continue statements for controlling loop execution.
Arrays: 1-D array creation and memory representation, Manipulating array elements, Linear Search, Binary Search, Bubble sort. 2-D array creation and memory representation, Programs on 2-D arrays.

Module -3

Pointer, Function and String (10 hours)

Pointers: Declaring and initializing Pointer, dereferencing pointer, Pointer and Array, Pointer Arithmetic, sizeof() operator, constant pointer, pointer to constant, void pointer, Null Pointer, Array of pointers and pointer to array. Self referential structures, Introduction to linked lists.
Functions: Types of functions, Parts of function, User defined functions, Call by value and call by reference, Passing array to function, pointer to function, function returning pointer, Recursive programming: understanding recursion, recursive functions, solving recursive problems.

Strings: String Input / Output functions, arrays of strings, string manipulation functions.

Module -4

Dynamic memory allocation, Structure and Union (7 hours)

Dynamic memory allocation: Concepts, heap area, malloc(), calloc(), realloc (), free() functions. Advantages of dynamic memory allocation, Programs on dynamic memory allocations.
Structure and Union: Need of structure, Creating a structure, typedef, array of structures, pointer to structure, passing structure to function, returning structure from function, self-referential structure. Creating a union, difference between structure and union. Enum creation, assigning value to enum variables.

Module-5

Macros, Storage Class and File handling (6 hours)

Macros: Macro expansion process, programs on Macro.
Storage classes: auto, extern, static, register. Scope of variables
File Handling: File opening modes, read and write text in file, file copy, reading and writing structure variables in a file, fseek, ftell. Error handling techniques for file operations.
Command Line Arguments and Pre-processor directives.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2. Programming in C, Pradip Dey, Manas Ghosh, Oxford Publication
3. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

Reference Books:

1. Let us C- Yashwant Kanetkar, BPB Publications.
2. ReemaThareja, Introduction to C Programming, 2nd Edition, Oxford University Press.
3. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
4. Problem solving with C, M.T.Somasekhara, PHI
5. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.

Online Resources:
https://nptel.ac.in/courses/106/105/106105171/
https://nptel.ac.in/courses/106/104/106104128/

Course outcomes:

Students will be able to:

CO1: To design simple algorithms for arithmetic and logical problems.
CO2: To implement the algorithms to C programs using various control structure.
CO3: To test and execute programs using function, array and string manipulation.
CO4: To apply memory allocation using pointers and structures for dynamic data structures.
CO5: To handle data storage in disk using file and storage class specifiers.

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1st Semester	BT-P-ES103	PROGRAMMING FOR PROBLEM SOLVING USING C LAB	L-T-P 0-0-2	Credit 1

Course objectives:

- To write, test, and debug simple C programs.
- To implement C programs with conditionals and loops.
- Use functions for structuring C programs.
- To understand and implement pointer and user defined data types
- To understand and implement the concept of arrays and user defined functions
- To understand file concept and dynamic memory application

Answer any 10 Experiments out of 15 Experiments:

Experiment No.1

a) Write a program to print your personal information using printf() statement (no input).

b) Write a program to print the result of all arithmetic operations on any two given integer numbers.

c) Write a program to calculate and print the volume and surface area of a cuboid for given values of length, breadth and height.

d) Write a program to assign total sum in rupees to a variable and print no. of 500 ,200,100,50,20 and 10 rupees notes.

Experiment No.2

a) Write a program to input basic salary of an employee .Calculate DA as 45% of basic, HRA as 18.5% of basic , TA as 5% of basic and tax as 10% of (basic+da+hra+ta) and net salary as (basic+da+hra+ta)-tax. Display above calculated values with proper headings.

b) Write a program to input two numbers and perform all arithmetic , relational ,logical and bitwise operators on them.

c) Write a program to input a year and print whether or not it is a leap year using conditional (ternary operator).

d) Write a program to enter the marks of a student in 4 subjects. Then calculate the total and average marks. Display the result as "PASS" if average>=50 , otherwise display the result as "FAIL" using con0% of annual salary excceding ditional operator.

Experiment No.3

a) Write program to input three numbers and print the highest number.

b) Write a program to input the coefficients (a,b and c) of a quadratic equation . Calculate and print the roots of the equation after verifying all properties of the roots.

c) Write a program to input annual salary of an employee . calculate tax s per the following format.

Annual salary	Tax rate
Upto 250000	Nil
250001-500000	10% of annual salary exceeding 250000
500001-750000	25000+20% of annual salary exceeding 500000
>750000	50000+30% of annual salary exceeding 750000

d) Write a program to input name and no. of units consumed by an electricity consumer. Calculate the electric bill as follows:

No. of units consumed	Bill Rate
First 100 units	Rs. 2.25 per unit

Next 200 units	Rs. 3.75 per unit
Next 200 units	Rs. 5.00 per unit
There after	Rs. 7.5 per unit

A surcharge of 2.5% of above bill is added to the bill of the consumers whose no. of units consumed is above 400. Display name of consumer, no. of units consumed and bill amount including surcharge if any.

e) Write a program to input marks of a student out of 100 and print the corresponding grade as follows-:

Marks	Grade
>=90	'O'
>=80 and <90	'E'
>=70 and <80	'A'
>=60 and <70	'B'
>=50 and <60	'C'
<50	'F'

Experiment No.4

a) Write a program to enter a number from 1-7 and display the corresponding day of the week using switch case statement.
b) Write a menu driven program to calculate and print volume of a cuboid or a Cube or Cylinder or Sphere according to user's choice by using switch case.
c) Write a program to input two numbers and an arithmetic operator. Calculate and print the corresponding result by using switch-case.
d) Write a menu driven program using switch-case to convert a temperature from Degree C to Degree F according to user's choice.

Experiment No.5

a) Write program to input a number and print whether or not it is a prime number.
b) Write a program to input a positive integer number and print its binary equivalent.
c) Write a program to check if an input number is palindrome number or not.
d) Write a program to print the following pattern as shown below.

```
1
2     3
4     5     6
7  8  9     10
```

e) Write a program to print the following pyramid Structure

```
          *
        *   *
      *   *   *
    *   *   *   *
  *   *   *   *   *
```

Experiment No.6

a) Write a C program to find both the largest and smallest number in a list of integers in an array.
b) Write a program to input 10 numbers into an array and print them in ascending order.
c) Write a program to find out the row sum and column sum of the elements of a m X n matrix.
d) Write a C program that uses functions for input, output, and display and find the product of two matrices.

Experiment No.7

a) Write a program to swap the value of two inputted variable using function. Show the initial value and value after swapping.
b) Write a program to find the greatest common divisor (GCD) using functions.
c) Write a program to input a number and print its factorial by using a recursive function.
d) Write program to generate and print the nth term of the Fibonacii series by using a function.

Experiment No.8

a) Write a C program to determine if an input string is palindrome or not. (A palindrome is a string which reads the same forwards and backwards. For example, "MADAM"
b) Write a program to input a sentence in uppercase and print frequency of each alphabet present in it.
c) Write a program to input a line of text and print no. words, no. of capital letters, no. of small letters, no. of digits and no. of special characters in it.
d) Write a program to accept a String and a substring. Print the position of the substring in the string if present, other wise print -1 if the substring is not present.

Experiment No.9

a) Write a program to input roll number, name and cgpa of a student using structure and print them with proper message.
b) Write a C program that to perform the addition, subtraction and multiplication of two complex numbers. (NOTE: represent complex number using a structure)
c) Write a program to read and print an array of n numbers, then find out the smallest number and its position in the array. Perform all these operations using pointer.
d) Write a program to implement malloc(), calloc() , realloc() and free().
e) Write a program to declare a pointer; allocate a block of memory to it using Dynamic Memory Allocation. Input a set of integers to the allocated memory block. And then display the set of numbers.

Experiment No.10

a) Write a C program which copies the contents of one file to another.
b) Write a C program to reverse the first n character in a file.
(NOTE: The file name and n are specified on the command line)
c) Write a program to read a set of numbers, check if positive or negative and then store the positive and negative numbers in two separate files POSITIVE and NEGATIVE respectively.

Course outcomes:

CO1: Read, understand and trace the execution of programs written in C language.
CO2: Develop programs using the basic elements like control statements, Arrays and String
CO3: Implement Programs with pointers, and learn to use the pre-processors, command line arguments etc.
CO4: Implement dynamic memory allocation for various data structures like arrays and structures.
CO5: **Develop** programs that perform various operations on files

Online Resources:
Virtual Lab by IIT Kharagpur. http://vlabs.iitkgp.ac.in/vlt/

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2nd Semester	BT-T-BS204	Engineering Mathematics-II (Differential Equations and Complex Variables)	L-T-P 3-0-0	Credit 3

Course Objectives:

The goal of the course Mathematics-II is to

- Familiarize the importance of ordinary differential equations and Fourier series.
- Applying the knowledge of Series solution and Laplace transform to solve problems.
- Familiarize the knowledge of complex valued functions.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module 1: **Differential Equations** ***(8 Lectures)***

Introduction to 1st order ODES,

Second order ODEs: Homogeneous linear ODEs with constant coefficients, Euler-Cauchy equations, non-homogeneous ODEs, Applications of ODEs to electric circuits.

Series solution of differential equations Legendre's equations and Legendre's polynomials Bessels function(Concept only)

Module 2: **Fourier Series** ***(8 Lectures)***

Fourier series: 2π and arbitrary periodic functions, even and odd function, half range sine and cosine series.

Module 3: **LaplaceTransforms*****(8 Lectures)***

Laplace transforms, inverse transforms, linearity, shifting, transforms of derivatives and integrals, solution of ODEs, unit step function, Dirac's delta function, differentiation and integration of transforms, convolution, integral equations.

Module 4: **Complex Variables** ***(8 Lectures)***

Complex valued function, differentiation, analytic function, Cauchy-Riemann equations, harmonic and conjugate harmonic functions.

Module 5: **Complex Variables** ***(8 Lectures)***

Line integral in the complex plane, statements of Cauchy's integral theorem and Cauchy's integral formula with basic applications, power series, radius of convergence, Taylor and Maclaurin series, singularities and zeros, Laurent series, Cauchy residue theorem (statement only) and applications.

Text Books:

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & Sons Inc. 10th Edition.
2. Fundamental of Complex Analysis by E.B. Saff, A.D.Snider, 3rd Edition, Pearson Education, New Delhi.

Reference Books:

1. Fourier Analysis: An Introduction by E.M. Stein, Princeton Lectures in Analysis
2. Differential Equations by S. L. Ross, 3rd Edition, Wiley India, 1984.
3. An Introduction to Ordinary Differential Equations, by E. A. Coddington, Prentice Hall India, 1995.
4. Higher Engineering Mathematics by B. V. Ramana, McGraw Hill Edu-cation.
5. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication.

Web links and Video Lectures (e-Resources):

COURSE OUTCOME

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

CO 1	Identify, formulate and solve Engineering problems. Apply the knowledge of Mathematics in Physical sciences and Engineering. Acquire knowledge about Series solution of Differential equations.
CO 2	Acquire knowledge about Fourier series.
CO 3	Acquire knowledge about Series solution of Differential equations.
CO 4	Acquire knowledge about complex variables and complex functions, analytic function, conjugate harmonic function and differentiability of complex functions.
CO 5	Acquire knowledge about complex integration using different techniques and acquire knowledge about power series.

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2nd Semester	BT-T-ES205	OBJECT ORIENTED PROGRAMMING USING JAVA	L-T-P 3-0-0	Credit 3

Prerequisite

Basic programming knowledge

Course Objectives:

- Understand the basic object-oriented programming concepts and apply them in problem solving.
- Illustrate inheritance concepts for reusing the program.
- Demonstrate on the multi-tasking by using multiple threads.
- Understand the basics of java console and GUI based programming.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module 1:(10 Lectures)

PN Junction Diode, Working Principle of Diodes, V-I characteristics of junction diode, AC and DC Resistance of Diode, Diode Current Equation, Temp effect on characteristics of diode, Equivalent circuit of Diode, Breakdown Mechanism, Zener diode and applications, Rectifier circuit, Clipper and Clamper Circuit.

Unit 1 (8 Hours)

Chapter 1-: An introduction to programming. Different types of programming languages, Description of Compiler and Interpreter, Advantage of Object-Oriented Programming.

Chapter 2-: Introduction to Java. what is Java? why Java? history behind Java, different versions of Java, difference between C/C++ and Java, features of Java, first Java Program, prerequisites Before start writing a java program, writing the program, compiling the program, executing the program, what is JVM and its significance in executing a program? architecture of JVM.

Chapter 3-: Understanding First Program and a step forward, understanding every term of the program, java tokens, datatypes, operators, what are operators? different types of operators, typecasting, control structures, conditional statements, loops, jumping statements, java arrays, multidimensional arrays, taking input from keyboard-command line arguments using Scanner, using BufferedReader .

Unit 2 (7 Hours)

Chapter 1-: Introduction to classes and objects, classes, methods, objects, description of data hiding and data encapsulation, constructors, use of static keyword in java, use of this keyword in java, array of objects, concept of access modifiers (public, private, protected, default).

Chapter 2-: Understanding inheritance, types of inheritance and java supported inheritance, significance of inheritance, constructor call in inheritance, use of super keyword in java, polymorphism, understanding polymorphism, types of polymorphism, method overloading, constructor overloading, method overriding, dynamic method dispatching.

Unit 3 (9 Hours)

Chapter 1-: Introduction to different classes-String, StringBuffer, StringBuilder, String Tokenizer, concept of wrapper classes, different predefined wrapper classes, predefined constructors for the wrapper classes, conversion of types from one type (object) to another type (primitive) and vice versa, concept of auto boxing and auto unboxing.

Chapter 2-: -Basics of data abstraction, understanding abstract classes, understanding interfaces, multiple inheritance using interfaces, introduction to packages, java API packages, user-defined packages, accessing packages, error and exception handling, introduction to error and exception, types of exceptions and difference between the types, runtime stack mechanism, hierarchy of Exception classes, default exception handling in java, user defined/customized exception handling, understanding different keywords (try, catch, finally, throw, throws), user defined exception classes, commonly used exceptions and their details.

Unit 4 (8 Hours)

Chapter 1-: Introduction of multithreading/multitasking, ways to define a thread in java, thread naming and priorities, thread execution/prevention methods (yield (), join (), sleep ()), concept of synchronisation, inter thread communication, basics of deadlock, demon thread, improvement in multithreading, inner classes-member inner class, static inner class, local inner class, anonymous inner class.

Chapter 2-: IO Streams (java.io package), introduction to byte stream and character stream, files and random-access files, serialization.

Unit 5 (8 Hours)

Chapter 1-: Introduction to java collections framework, util package interfaces-list, set, map etc, List interfaces and its classes, Setter interfaces and its classes.

Chapter 2-: Life cycle of an applet, GUI with an applet,Swing (JFC), difference between AWT and Swing, individual swings Components - JLabel, JButton, JTextField, JTextArea, exploring javax package.

Text Books:

T1: Java 8 Programming Black Book Paperback by D.T. Editorial Services [John Wiley]

T2: Java Complete Reference by Herbert Schildt [11th Edition] [McGraw-Hill Education]

Reference Books:

R1: Head First Java by Kathy Sierra, Bert Bates [2nd Edition] [O'Reilly Media, Inc.]

Online Resources:

1-http://docs.oracle.com/javase/tutorial/

2-https://www.codejava.net/books/4-best-free-java-e-books-for-beginners

COURSE OUTCOME

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

CO 1	Knowledge of the structure and model of the Java programming language, (knowledge)
CO 2	Use the Java programming language for various programming technologies (understanding)
CO 3	Develop software in the Java programming language, (application)
CO 4	Evaluate user requirements for software functionality required to decide whether

	the Java programming language can meet user requirements (analysis)
CO 5	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis).
CO 6	Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

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2nd Semester	BT-P-ES206	OBJECT ORIENTED PROGRAMMING USING JAVA LAB	L-T-P 0-0-2	Credit 1

Course Objectives :

1.To teach fundamentals of object-oriented programming in Java. Understand various concepts of Java.

2. To familiarize Java environment to create, debug and run simple Java programs.

3. To demonstrate java compiler and eclipse platform and learn how to use Net Beans IDE/Eclipse/Atom/Visual Studio Code to create Java Application.

Evaluation Scheme

Experiment (work) Planning and execution	Results and interpretation	Report	Viva-voce to experiment	Total
20	30	30	20	100

At least 10 Experiments

1 Write a Java program that prints all real solutions to the quadratic equation ax2 +bx + c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a message stating that there are no real solutions.

2 The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non-recursive functions to print the nth value in the Fibonacci sequence.

3 Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (Use Scanner class to read input)

4 Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

5 Write a Java program for sorting list of names. Read input from command line.

6 Write a Java program to make frequency count of words in a given text.

7 Write a Java program to create a Student class with following fields i. Hall ticket number ii. Student Name iii. Department Create ‘n’ number of Student objects where ‘n’ value is passed as input to constructor.

8 Write a Java program that creates three threads. First thread displays “Good Morning” everyone second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds

9 Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

10 Develop simple calculator using Swings

Course Outcomes

At the end of this course, the students will be able to:

CO 1	Implement Object oriented features using Java
CO 2	Apply the concept of polymorphism and inheritance.
CO 3	Implement exception handling
CO 4	Develop window-based application using Swing.

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2nd Semester	BT-P-HS202	BUSINESS COMMUNICATION AND LIFE SKILLS (LAB)	L-T-P 0-0-2	Credit 1

Course Objectives :

Sl. No	Activity	Procedure	Skills Used
1	Reading Comprehension	Passages Based On A Variety Of Topics Will Used To Increase Reading Comprehension Skills On Business Topics Followed By Questions To Be Answered	Reading , Writing, Speaking
2	Business Letter Writing	Students Will Write Business Letters Based On Case Studies Provided By The Facilitator	Writing, Speaking, Listening
3	Business Vocabulary	Short Business Passages On The Economoy Will Be Provided To Students Followed By Vocabulary Building Exercises And Discussion On Takeaways With Peer Group Feedback	Reading , Writing, Speaking, Listening
4	Mock Interview -I	Students Will Be Interviewed By The Facilitator Or A Panel Of Facilitators Based On Questions Discussed In The Classroom.Same.Discussion On Takeaways With Peer Group Feedback.	Listening & Speaking
5	Situational Dialogues On Business Conversations	List Of Vocbulary(Business).3-4 Students Per Team Will Prepare,Practice And Enact Roles. Discussion On Takeaways With Peer Group Feedback.	Reading , Writing ,Speaking, Listening
6	Group Discussion-I	Students Will Be Taught The Basics Of A Group Discussion And Get To Participate In Gd's Based On Topics Shared By The Facilitator	Listening & Speaking
7	Extempore - Business Topics	The Student Will Be Given Topics Pertaining To The Business World Followed By Presentations By The Students.Discussion On Takeaways With Peer Group Feedback.	Speaking
8	Listening To Podcasts	Short Audio Clips/Podcats (Minimum 6mins X2)Will Be Used To Increase Listening Comprehension Followed By Questions To Be Answered.	Listening & Writing
9	Mock Interview -Ii	Students Will Be Interviewed By The Facilitator Or A Panel Of Facilitators Based On Questions Discussed In The Classroom.Same.Discussion On Takeaways With Peer Group Feedback.	Listening & Speaking
10	Jam Speaking Test (Business Topics)	Students Will Be Provided With A List Of Business Related Content And They Will Make Presentations Based On The Same.Discussion On Takeaways With Peer Group Feedback.	Reading, Researching, Speaking And Listening
11	Power Point Presentation Or Project Work	Students Will Pick A Topic Of Their Interest, Work In Pairs/ Groups And Make Power Point Presentations On The Same	Listening, Speaking, Reading & Writing
12	Group Discussion-Ii	Students Will Get To Participate In Gd's Based On Topics Shared By The Facilitator.Same.Discussion On Takeaways With Peer Group Feedback.	Listening & Speaking

13	Mock Interview -Iii	Students Will Be Interviewed By The Facilitator Or A Panel Of Facilitators Based On Questions Discussed In The Classroom.Same.Discussion On Takeaways With Peer Group Feedback.	Listening & Speaking
14	Group Discussion-Iii	Students Will Get To Participate In Gd's Based On Topics Shared By The Facilitator.Discussion On Takeaways With Peer Group Feedback.	Listening & Speaking

Evaluation Scheme

Experiment (work) Planning and execution	Results and interpretation	Report	Viva-voce to experiment	Total
20	30	30	20	100

Course Outcomes

At the end of this course, the students will be able to:

CO 1	1. To learn the nuances of effective business communication, to improve their thought process and enable them to think critically by making them go through presentations on business topics
CO 2	2. To listen to audio clips or podcats and be able to comprehend the meaning as well as the context of the clip. This will enable the student to better understand business concepts and enable them to speak English with a neutral accent.
CO 3	3. To read and understand the meaning of of a given business text drawn from and original source and be able to write answers based on the same passage.
CO 4	4. To be able to participate in mock interviews and learn the nuances of doing company research in order to prepare for the real PI.
CO 5	5. Practice the etiquette of a Group Discussion through practice sessions.
CO 6	6. Imbibe the knowledge of effective speaking and presentation required for various business contexts, using power point presentations.
CO 7	7. Learn the nuances of effective business writing by using business vocabulary and jargon.
CO 8	8. Understand business terminology and improve business knowledge by reading business texts.

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2nd Semester	BT-T-HS202	UNIVERSAL HUMAN VALUES- II	L-T-P 2-0-0	Credit 2

Prerequisite
Universal Human Values 1 (desirable) (during 3 weeks of SIP)

Course Objectives:
The objective of the course is four fold:
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

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

DETAILED SYLLABUS:
The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1:
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above 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 coexistence) rather than as arbitrariness in choice based on liking-disliking

Module 2:
Understanding Harmony in the Human Being - Harmony in Myself!
1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'

5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
6. 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 3:

Understanding Harmony in the Family and Society- Harmony in Human Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from 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 4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self regulation in nature
3. Understanding Existence as Co-existence of mutually interacting units in allpervasive space
4. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.
Include practice Exercises and Case Studies will be taken up in Practice Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel

Books, New Delhi, 2010

Reference Books:

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

COURSE OUTCOME

Upon Completion of the subject the students will demonstrate the ability to:

CO 1	More aware of themselves, and their surroundings (family, society, nature);
CO 2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO 3	They would have better critical and analytical ability and sense of living in harmony
CO 4	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
CO 5	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

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2nd Semester	BT-T-MC201	ENVIRONMENTAL SCIENCE	L-T-P 1-0-0	Credit 0

Pre-Requisites
Basic knowledge of physics, chemistry and biology is required for this course.

Course Objectives:
This course serves as a general introduction to environmental science. From ecology and ecosystems, it acquaints the students to air & water quality and the impact of pollution on the environment due to industries and urbanization. Some remediation methods of minimizing the impact of pollutants through technology and legal systems are also addressed.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

Module 1: **5 Hours**
Ecology & Biogeochemical Cycles: Introduction to environmental science, ecological perspective and value of environment, biodiversity of species, biotic components, energy flow, food chain, food web,biogeochemical cycles like water, oxygen, nitrogen and carbon cycle.

Module 2: **4 Hours**
Atmospheric chemistry, soil chemistry, noise source & abatement: atmospheric chemistry, air pollution, climate change. Environmental gradients : Environmental gradients, tolerance levels of environment factors

Module 3: **3 Hours**
Water & Wastewater Treatment: Water quality standards and parameters, pre-treatment and conventional treatment processes of water, DO, BOD, COD, wastewater treatment.
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Module 4: **3 Hours**
Waste Management: Municipal Solid Waste (MSW), Hazardous waste and e-waste handling & management

Module 5: **3 Hours**
Introduction to Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS). Environmental acts: Indian environmental laws, Activities including seminar presentations by students.

Text Books:

1. T1. G. M. Masters and W. P. Ela, An Introduction to Environmental Engineering and Science, 3rd Edition, PHI Learning, 2015.
2. T2. G. Kiely, Environmental Engineering, Spl. Indian Edition, McGraw Hill, 2007.

Reference Books:

1. R1. M. L. Davis and S. J. Masten, Principles of Environmental Engineering and Science, 2nd Edition, McGraw-Hill, 2017.

2. R2. H. D. Kumar and U. N. Dash, Environmental Studies, 2nd Edition, IndiaTech Publishers, 2017.

Web links and Video Lectures (e-Resources):

1. http://nptel.ac.in/courses/120108002/: Aquatic Biodiversity and Environmental Pollution.
2. http://nptel.ac.in/courses/120108004/: Environment Management.
3. http://nptel.ac.in/courses/120108005/: Municipal Solid Waste Management.
4. https://www.epa.gov/environmental-topics/: All Current Environmental Issues.

COURSE OUTCOME

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

CO 1	Apply concepts of ecology, eco systems, food chain and biogeochemical cycles for better understanding of functions of the environment.
CO 2	Understand environmental gradients, tolerance levels . Understand the chemistry of pollutants in the atmosphere, soil and groundwater and understand principles of noise abatement
CO 3	Enhance knowledge of water and wastewater treatment for prevention of water pollution.
CO 4	Enhance knowledge of waste minimization technique to minimize and manage solid, hazardous wastes generated in different areas.
CO 5	Environmental laws for prevention of environmental pollution.

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2nd Semester	BT-T-ES204	BASICS OF CIVIL & MECHANICAL ENGINEERING	L-T-P 3-0-0	Credit 3

Pre-Requisites
Basics of Physics, Basics of Chemistry, Engineering Materials, Mathematics.

Course Objectives:
This course aims to expose the students to the thrust areas in Civil and Mechanical Engineering and the irrelevance by covering fundamental concepts.

Evaluation Scheme

Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	Total
05	05	05	25	60	100

DETAILED SYLLABUS:

Module - I (8 Hours)
Construction materials : Bricks, Stone, Fine aggregate, Course aggregate, Cement, Reinforcement Steel, Concrete (PCC & RCC) (Definition, classification and application)
Building

Components: Foundation, DPC, Flooring, Masonry, Chaaja, Lintel, Roof, Doors & Windows, and Staircase. Foundation: Types of shallow and deep foundations with sketches..

Module - II (8 Hours)
Basic Surveying: Necessity of Survey, Types of survey and their application, Different survey Equipment.
Transportation: Modes of Transportation, Cross Section of a Road, Rigid and Flexible pavement (comparison only). Public Health Engineering: Quality of water, Components of water Treatment Plant, Distribution, Sewage System and its components.

Module - III (8 Hours)
Hydraulic Machines:
Hydraulic Pumps- Centrifugal Pump - Different Efficiencies of Centrifugal Pump, working principles of Centrifugal Pump (With Schematic diagram only) and Reciprocating PumpSingle acting and Double acting reciprocating pump (working principles with Schematic diagram only).

Hydraulic Turbines- Classifications of Hydraulic Turbines, Different Efficiencies of Hydraulic Turbines and their Applications. Hydro Electric Power Plants (Schematic labeled diagram of layout).

Module – IV (08Hours)

Application of Thermodynamics:

I.C. Engines- Classification of I. C. Engines, Parts of I. C. Engines, Comparison of S. I. and C. I. Engine, Comparison of 2-stroke and 4-stroke Engine with schematic diagram, Difference between Otto Cycle and Diesel Cycle.

Refrigerators – Simple vapour compression refrigeration cycle, different refrigerants, working principle and brief description of main components a refrigerator with schematic diagram.

Modern Steam Power Plant – Working of a steam power plant (Schematic diagram of layouts with brief description of its components), Classification of Boilers, Boiler Mountings and Accessories,.

Automobile Engineering: Layout diagram of an automobile power transmission system with brief description of clutch, gear and differential. Automobile Braking System- Classification, brief description about internal expanding brakes. (working principles with schematic diagram only).

Module V (08 Hours)

Basic Manufacturing Processes:

Robotics: Robot Definitions, Robotic system (Schematic diagram showing different components), Specifications of robots, Applications of industrial robots.

Foundry Practices: Pattern, Mould & Casting (Elementary ideas only) and Gating System – with neat labeled diagram showing elements of a gating system. Mechanical working of metals: Specifications of sheets, strips, plates, slabs, billets and blooms. Different sheet metal operations. Different sheet metals and their applications (Elementary ideas only)

Text Books:

1. Building Material & Construction, G.C. Sahu & J. Jena, McGraw Hill Eduction (India) Pvt. Ltd.

2. Surveying, B.C. Punmia, Laxmi Publication Pvt. Ltd.

3. Power Plant Engineering, by P.K. Nag,Tata McGraw-Hill, New Delhi.

4. Fluid Mechanics & Hydraulic Machines by Dr R. K. Bansal, Laxmi Publications.

5. Elements of Workshop Technology- Volume-I by S. K. HAJRACHOUDHURY, A. K. HAJRACHOUDHURY; Media Promoters & Publishers Pvt. Ltd.

6. Robotics Technology and Flexible Automation by S. R. Deb Tata McGraw Hill Publication.

7. A Course in Automobile Engineering by R. P. Sharma ; Dhanpat Rai & Sons.

8. Basic Mechanical Engineering by A R Israni, P K Shah, B. S. Publications

Reference Books:

1. Manufacturing Technology by P.N.Rao, Tata McGraw Hill publication.

2. Manufacturing Science by A.Ghosh and A K Malick, EWP.

3. A Text Book of Production Engineering by P.C.Sharma, S.Chand.

4. Basic Mechanical Engineering by .D. Mishra, P.K Parida, S.S.Sahoo, India Tech Publishing company.
5. Elements of Mechanical Engineering by J K Kittur and G D Gokak,Willey.
6. Basic Civil Engineering, S. Gopi, Pearson
7. Basic Civil Engineering, Bhavikatti, S. S., New Age.
8. Thermal Engineering by P. L. Ballaney, Khanna Publishers.

COURSE OUTCOME

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

CO 1	Understand the basics of civil engineering works that ,in the form of buildings, building components, building materials and building construction .
CO 2	Learn the basic elements of surveying which is a prerequisite for any design construction, understand the concepts transportation system and necessity and planning requirement in public health engineering .
CO 3	Understand the working principles of jets, turbine and pump their design parameters , their efficiency and usefulness.
CO 4	Know and understand the application of thermodynamics in various areas like IC engines used in automobiles, refrigeration and power plant along with their construction &working principles.
CO 5	Know and understand about basic manufacturing processes by using foundry and sheet metals and also get a quick knowledge about basic components of a robotic system.

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