**FIRST YEAR- B. TECH COURSE STRUCTURE & SYLLABUS**

**FIRST YEAR (*FIRST SEMESTER*)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Group of Branches -I** | | **Group of Branches -II** | | **Contact Hrs.**  **L-T-P** | **Credit** |
| **Subject Code** | **Theory** | **Subject Code** | **Theory** |
| 1 | BH1441 | Mathematics - I | BH1441 | Mathematics - I | 3-0-0 | 3 |
| 2 | BH1461 | Physics | BH1401 | Chemistry | 3-0-0 | 3 |
| 3 | EE1401 | Basic Electrical Engineering | EI1401 | Basic Electronics | 2-0-0 | 2 |
| 4 | CS1401 | Programming in C and Data Structures | MS1403 | Engineering Mechanics | 3-0-0 | 3 |
| 5 | IP1401 | Basic Civil Engineering | MS1401 | Basic Mechanical Engineering | 2-0-0 | 2 |
| 6 | BH1421 | Universal Human Values | BH1423 | English for Technical Writing | 2-0-0 | 2 |
|  | | **Sessional** |  | **Sessional** |  | |
| 7 | BH1561 | Physics Laboratory | BH1501 | Chemistry Laboratory | 0-0-3 | 1.5 |
| 8 | EE1501 | Basic Electrical Engineering Laboratory | EI1501 | Basic Electronics Laboratory | 0-0-3 | 1.5 |
| 9 | CS1501 | Programming Laboratory | BH1521 | Communicative English & Report Writing Laboratory | 0-0-3 | 1.5 |
| 10 | IP1501 | Engineering Graphics & Design Laboratory | MS1501 | Workshop & Digital Manufacturing Laboratory | 0-0-3 | 1.5 |
| 11 | BH1581/  BH1583 | Sports/Yoga | BH1585/ BH1587 | NCC/NSS | 0-0-2 | 1 |
| **Total** | | | | | **15-0-14** | **22** |

**FIRST YEAR (*SECOND SEMESTER*)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Group of Branches -II** | | **Group of Branches -I** | | **Contact Hrs.**  **L-T-P** | **Credit** |
| **Subject Code** | **Theory** | **Subject Code** | **Theory** |
| 1 | BH1442 | Mathematics - II | BH1442 | Mathematics - II | 3-0-0 | 3 |
| 2 | BH1401 | Chemistry | BH1461 | Physics | 3-0-0 | 3 |
| 3 | EI1401 | Basic Electronics | EE1401 | Basic Electrical Engineering | 2-0-0 | 2 |
| 4 | MS1403 | Engineering Mechanics | CS1401 | Programming in C and Data Structures | 3-0-0 | 3 |
| 5 | MS1401 | Basic Mechanical Engg | IP1401 | Basic Civil Engg | 2-0-0 | 2 |
| 6 | BH1423 | English for Technical Writing | BH1421 | Universal Human Values | 2-0-0 | 2 |
|  | | **Sessional** |  | **Sessional** |  | |
| 7 | BH1501 | Chemistry Laboratory | BH1561 | Physics Laboratory | 0-0-3 | 1.5 |
| 8 | EI1501 | Basic Electronics Laboratory | EE1501 | Basic Electrical Engineering Laboratory | 0-0-3 | 1.5 |
| 9 | BH1521 | Communicative English & Report Writing Laboratory | CS1501 | Programming Laboratory | 0-0-3 | 1.5 |
| 10 | MS1501 | Workshop & Digital Manufacturing Laboratory | IP1501 | Engineering Graphics & Design Laboratory | 0-0-3 | 1.5 |
| 11 | BH1585/ BH1587 | NCC/NSS | BH1581/ BH1583 | Sports/Yoga | 0-0-2 | 1 |
| **Total** | | | | | **15-0-14** | **22** |

# BH1401: Chemistry (3-0-0: 3)

**Module–I: (06 Hours)**

**Spectroscopic Techniques and Applications**

Basic terms and principles of spectroscopy

Molecular rotational (microwave) spectroscopy: Basic principle and application to diatomic molecules, selection rules.

M**olecular vibrational (IR) spectroscopy:** Basic principle, types of vibrations, vibrational frequency, selection rules.

**Electronic (UV-Visible) spectroscopy:** Laws of absorption, basic principle, types of electronic transitions, chromophores, effect of conjugation on chromophores.

**Drugs and Dyes (04 Hours)**

Introduction to drugs, characteristics, classification of drugs, synthesis of drugs (Ibuprofen, Paracetamol, and Aspirin), Introduction to dyes, Structural features of a dye, classification of dyes, synthesis of dyes (Phenolphthalein, Methyl orange, Congo red)

**Module–II**

**Concept of Free Energy (06 Hours)**

Concepts of entropy, entropy in physical and chemical changes, Free energy concepts, application to gases, Gibbs-Helmholtz equation, free energy change and criterion of spontaneity, Maxwell’s relations.

**Fuel and its Application (04 Hours)**

Introduction, classification of fuel, Calorific value and its calculation, Petroleum: classification, origin, refining, knocking, combustion of fuel and its calculation.

**Module–III**

**Equilibria involving Oxidation and Reduction (06 Hours)**

Oxidation and Reduction, Reference electrodes (SHE, SCE, Quinhydrone electrode), Standard electrode potential, Electromotive force (emf) of a cell and its relationship with ∆G0 and K, Nernst equation, Determination of pH using glass electrode, Batteries (lead accumulator, Nickel-Cadmium alkaline cell, H2-Fuel cell)

**Corrosion (04 Hours)**

Introduction, Types of corrosion including mechanism, Factors affecting corrosion and its control

**Essential books:**

* Engineering Chemistry: Fundamentals and Applications, S. Agarwal; Cambridge University Press, 02ndEdition, 2019.
* Engineering Chemistry, P.C. Jain and M. Jain, Dhanpat Rai Publishing company (P) Ltd., 16th Edition, 2015.
* Theory and practicals of Engineering Chemistry, Sashi Chawla, Dhanpat Rai Publishing company (P) Ltd.
* Synthetic Organic Chemistry, O. P. Agrawal, GOEL publishing house, Meerut, 14th Edition, 2006.

**Reference Books:**

* Principles of Physical Chemistry, B.R. Puri, M.S. Pathania, and L.R. Sharma, Vishal Publishing; 47th Edition, 2020.
* Fundamentals of Molecular Spectroscopy, C.N. Banwell and E.M. McCash, McGraw Hill Education, 4th Edition, 2017.
* Engineering Chemistry: concepts in chemistry for engineering, Satya Prakash Agrawal and Manisha Agrawal, Khanna book publishing Co. (P) Ltd., Revised Edition, 2021.

**Course Outcomes:**

**CO1:** Develop the concept of fundamental and basic principle of spectroscopy and application to dye and Pharmaceuticals Industry.

**CO2:** Expandtheknowledge on thermodynamic properties and its application to petroleum industry.

**CO3:** To implement the idea of redox reactions in energy generation and corrosion.

**Course Articulation Matrix**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO4 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO5 | 2 | 3 | 3 | 2 | 2 | 3 |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

**Program Articulation Matrix Row for this Course**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| Course | 2 | 3 | 3 | 2 | 2 | 3 |

# BH1423: English for Technical Writing (2-0-0: 2)

**Ist/IInd Sem**

**Course Objectives**:

* To introduce engineering students to the theory and practice of communication.
* To equip them with both theoretical vocabulary and basic tools which will help them develop as better communicators.
* To initiate them to select literary texts and establish how these texts contribute to the afore-mentioned objectives.

**Module-I**

**Introduction to Communication: (8 hours)**

1.1 Importance of Communication in English (1 hour)

1.2The process of communication and factors that influence the process of communication:

Sender, receiver, channel, code, topic, message, context, feedback, ‘noise’. (2 hours)

1.3 Principles of Communication. (1hour)

1.4 Barriers to Communication & Communication Apprehension (1 hour)

1.5Verbal (Spoken and Written) and non-verbal communication, Body language and its importance in communication. (3 hours)

**Module-II**

**Phonetics and Functional Grammar** (**7 hours)**

2.1 Sounds of English: Vowels (Monopthongs and Diphthongs), Consonants (1 hour)

2.2 Syllable division, stress (word, contrastive stress) & intonation (1 hour)

2.3 MTI and problem sounds (1 hour)

2.4Review of Parts of Speech(2 hour)

2.5 Subject and Predicate, Tense, Voice Change (1 hour)

2.6 Idioms and Phrasal Verbs (1 hour)

(**Note :** This unit should be taught in a simple, non-technical, application oriented manner, avoiding technical terms as far as possible.)

**Module-III**

**Reading Literature**  (5 **hours**)

**Prose:**

1. Stephen Leacock: My Financial Career
2. Mahatma Gandhi: from My Experiments with Truth.
3. O’Henry: The Last Leaf

**Poetry:**

1. Nissim Ezekiel: Professor
2. Jack Prelutsky: Be glad your nose is on your face.
3. Maya Angelou: Still I rise (Abridged)

**Essential books:**

* Paul V.Anderson, *Technical Communication*, Cengage Learning, 2014.
* Leech, Geoffrey and Ian Swartik, *A Communicative Grammar of English*, Longman, 2003.
* O’Connor, J.D., *Better English Pronunciation*, Cambridge University Press, 1980.
* Wren & Martin, *English Grammar and Composition,* S.Chand, 1995.

# BH1441: Mathematics – I (3-0-0: 3)

**COURSE OBJECTIVES:**

The goal of the course Mathematics-I is to

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

***Module 1:* Linear Algebra*(10 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.

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

***Module 2: Basic Calculus,Calculus of Sequences and Series(10 Lectures)***

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

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

Limit of sequence, monotone and Cauchy sequence with basic properties on convergence, Infinite series, positive term seriesand tests of convergence (comparison test, ratio test and integral test).

***Module3: Vector Calculus (10 Lectures)***

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

Line integrals of scalar and vector valued functions, double integrals, change of order, Green's theorem(statements only), Applications: areas and volumes, center of mass and gravity.

**Essential books:**

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

Reference Books:

* Higher Engineering Mathematics by B. V. Raman, McGraw Hills Education.
* Higher Engineering Mathematics by B. S. Grewal, Khanna Publication.
* 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*** | 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 linier equations. |
| ***CO 2*** | Apply essential tool to solve numerical problems based on Eigen values, Eigen vectors, diagonalisation and orthogonalisation 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. |
| ***CO 3*** | 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 4*** | Examine the behaviour of sequence and series for a given interval. |
| ***CO 5*** | Acquire knowledge of vector & integral calculus and their application in engineering subjects. |

# BH1461: Physics (3-0-0: 3)

**Course Objective:** To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology

**PROGRAM EDUCATIONALOBJECTIVES:**

Graduates of Engineering Physics will be able to:

1. To produce future-ready engineers with a strong foundation in science, to cater to the requirements of R&D

establishments focused on developing state-of-the-art and upcoming technologies.

2. Practice in professions requiring an essential perceptive of the principles of physics and engineering.

3. Preserve professional proficiency in swiftly-advancing scientific and technical areas.

4. Pursue advanced degrees in physics, engineering, and other professional fields.

5. To enhance their problem-solving skills and independent thinking through an adequate curriculum.

**Syllabus:**

|  |  |
| --- | --- |
| **MODULE - I** | |
| **OSCILLATIONS** | **Hours:7** |
| Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, steady state motion of forced damped harmonic oscillator, Coupled oscillator | |
| **WAVES AND OPTICS** | **Hours:6** |
| Concept of wave and Wave equation, Superposition of many harmonic waves, Interference: Concept of coherent sources (Division of wave front and division of amplitude),Interference in thin parallel film, Newton's ring (Theory, **Application:** Determination of wavelength of light, Refractive index of liquid). Concept of diffraction (Huygen's Principle), Types of diffraction, Franhoffer diffraction due to single slit, diffraction grating (qualitatively). | |
| **MODULE - II** | |
| **LASERS & OPTICAL FIBERS** | **Hours:4** |
| Introduction to Laser, Characteristics of Lasers, Absorption and Emission, Lasing action, Population inversion, three level pumping scheme, Ruby Laser, Structure of optical fiber, Total internal reflection, Types of fibers. | |
| **ELCTROMAGNETISM** | **Hours:6** |
| **Vector calculus**: Gradient, Divergence, Curl (Mathematical concept), Gauss divergence theorem and Stoke's theorem (statement only), Derivation of Maxwell's electromagnetic equation in differential form and integral form, Concept of vector and scalar potentials, Electromagnetic wave equations for **E** and **B** in vacuum and conducting medium, transverse nature of EM waves. | |
| **MODULE - III** | |
| **QUANTUM PHYSICS** | **Hours: 7** |
| Wave particle duality, concept of phase velocity group velocity, relation between them, Heisenberg Uncertainty principle with harmonic oscillator application, Wave functions, Observable as operators, Eigen function and Eigen values, Normalization, Expectation values, Schrodinger equation (Time dependent and time independent), free particle and Particle in a box. | |

**Essential books:**

* Lectures in Engineering Physics, L Maharana, P K panda, S N Dash, B Ojha, Pearson
* Ian G. Main, Oscillations and waves in physics, Cambridge University Press
* H.J. Pain, The physics of vibrations and waves, John Wiley & Sons Ltd.
* E. Hecht, Optics, Pearson Education Ltd.
* Ghatak, Optics, McGraw Hill Publisher
* O. Svelto, Principles of Lasers, Springer

|  |
| --- |
| **Course Outcome:**At the end of this course students will demonstrate the ability to  **CO1:** Demonstrate proficiency and perceptive of the basic concepts in physics.  **CO2:** Utilize the scientific and experimental methods to investigate and verify the concepts related to  content knowledge.  **CO3:** Exploring the engineering applications and apply quantum mechanics to engineering  Phenomena.  **CO4:** Identifying the relevant formulae and work out engineering problems.  **CO5:** Comprehend principle, concept, working and application of new technology and comparison of  results with theoretical calculations. |

**CO-PO Mapping:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 |
| CO5 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 2 |

# BH1421: Universal Human Values (2-0-0: 2)

**Module 1- Foundations of Value Education**

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Lecture 3: Self-exploration as the Process for Value Education

Lecture 4: Continuous Happiness and Prosperity - the Basic Human Aspirations

Lecture 5: Happiness and Prosperity-Current Scenario

Lecture 6: Method to Fulfil the Basic Human Aspirations

**Module 2-Harmony in the Human Life, Relationships and Society**

Lecture 7: Understanding Human being as the Co-existence of the Self and the Body

Lecture 8: Distinguishing between the Needs of the Self and the Body

Lecture 9: Achieving Harmony: Integrating Self and the Body

Lecture 10: Harmony in the Family and Society

Lecture 11: 'Trust'& ‘Respect’–as Foundational Values in Relationship

Lecture 12: Other Feelings, Justice in Human-to-Human Relationship

Lecture 13: Understanding Harmony in the Society & Universal Human Order.

**Module 3-Harmony in the Nature/Existence & Professional Ethics**

Lecture 14: Understanding Harmony in the Nature

Lecture 15: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Lecture 16: Realizing Existence as Co-existence at All Levels

Lecture 17: The Holistic Perception of Harmony in Existence

Lecture 18: Natural Acceptance of Human Values

Lecture 19: Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 20: Competence in Professional Ethics – Ethical Decision Making&Transition towards Value-based Life and Profession.

# BH1501: Chemistry Laboratory (0-0-3: 1.5)

**(Any ten Experiments)**

1. To determine the alkalinity in a given water sample.
2. To determine the temporary and permanent hardness in the given water sample bycomplexometric titration using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Estimation of Nickel using Eriochrome Black T indicator.
5. Standardization of Potassium permanganate using sodium oxalate.
6. Determination of ferrous iron in Mohr’s salt by Potassium permanganate.
7. To determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution using*p*H meter.
8. Conductometric titration of strong acid and strong base.
9. Determination of flash point of given oil by Pensky–Martensflash point apparatus.
10. To find out the concentration of given Potassium permanganate solution spectrophotometrically.
11. Synthesis of Aspirin/Paracetamol/PMA.
12. Determination of Surface tension and Viscosity.
13. Colligative properties using freezing point depression.
14. Saponification/Acid value of oil.
15. Chemical analysis of salt.
16. Determination of the partition coefficient of a substance between two immiscible liquids.
17. Preparation of hand sanitizer.

**Essential books:**

* A Textbook on Experiments and Calculations in engineering Chemistry, S.S. Dara, S. Chand and Company Ltd., 9th Edition, 2015.
* Laboratory Manuals on Engineering Chemistry, S.K. Bhasin, S. Rani, DhanpatRai Publishing, 2015.

**Course Outcomes:**

**CO1:**Develop experience in estimating hardness, alkalinity of water, quality of industrial materials andthe composition of given compound by titration.

**CO2:**Demonstrate the handling of different instruments.

**CO3:**Develop the knowledge to synthesize pharmaceutical or polymeric compounds.

**CO4:**Learn to measure molecular properties such as surface tension and viscocity, gain practical experience on the effect of solute on solution properties.

**CO5:** Learn to analyse salt samples, determine the distribution coefficient of solute in immiscible liquids.

**Course Articulation Matrix**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO4 | 2 | 3 | 3 | 2 | 2 | 3 |
| CO5 | 2 | 3 | 3 | 2 | 2 | 3 |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

**Program Articulation Matrix Row for this Course**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| Course | 2 | 3 | 3 | 2 | 2 | 3 |

# BH1521: Communicative English & Report Writing Laboratory (0-0-3: 1.5)

**Course Objectives:**

* The laboratory experience for this course aims at acquainting the learners with their strength and weakness in expressing themselves, their interests and academic habits.
* To improve their skills of LSRW (Listening, Speaking, Reading and Writing) through mutual conversation and activities related to these skills.
* To promote the creative and imaginative faculty of the students through practice before the teacher-trainer.

There will be 10 sessions of 2 hours each. Lab sessions will give a platform for the students to indulge in activities based on the first two modules of theory taught in the class room. All the lab classes will be divided in such a manner that all the four aspects of language (LSRW) are covered.

**Ist session:**

Speaking: Ice-breaking and Introducing each other (1 hour), Writing: Happiest and saddest moment of my life (1 Hour)

**IInd session:**

Listening: Listening practice (ear-training): News clips, Movie clips, Presentation, Lecture or speech by a speaker (1 Hour), Speaking: Debate (1 Hour)

**IIIrd session:**

Reading: Reading comprehension (1 Hour), Writing: Creative writing (Short story: Hints to be given by the teacher) (1 Hour)

**IVth session:**

Reading: Topics of General awareness, Common errors in English usage (1 Hour), Writing: Construction of different types of sentences (1 Hour)

**Vth session:**

Speaking: Practice of vowel and consonant sounds (1 Hour), Writing: Practice of syllable division (1 Hour)

**VIth session:**

Speaking: My experience in the college/ or any other topic as per the convenience of the student (1 Hour), Writing: Phonemic transcription practice (1 Hour).

**VIIth session:**

Listening: Practice of phonetics through ISIL system and also with the help of a dictionary (1Hour), Speaking: Role-play in groups (1 Hour)

**VIIIth session:**

Speaking: Practice sessions on Stress and Intonation (1Hour), Writing: Practice sessions on Grammar(Tense and voice change)(1 Hour)

**IXth session:**

Speaking: Extempore, (1 Hour), Writing: Framing sentences using phrasal verbs and idioms (1 Hour).

**Xth session:**

Watching a short English movie (1 Hour), Writing: Critical analysis of the movie (1 Hour).

**Note: 70 marks will be devoted for sessions, 10 marks for record submission, 10 marks for viva-voce and 10 marks for project work.**

**End term assignment:** Students are required to make a project report of at least5 pages on a topic on the following broad streams: Technology, General awareness, Gender, Environment, Cinema, Books and the like. The assignment should involve data collection, analysis and reporting.

# BH1561: Physics Laboratory (0-0-3: 1.5)

**List of Experiments**

1. Determination of acceleration due to gravity by using Bar pendulum
2. To determine the acceleration due to gravity by Katter’s pendulum.
3. Determination of Young’s modulus of material with the help of bending of beam.
4. To determine the rigidity modulus of the material of a wire by using Barton’s apparatus.
5. Study of resonance using sonometer for unknown frequency
6. Determination of surface tension of water by capillary rise method
7. Determination of magnetic field measurement using Helmholtz coil.
8. Determination of wave length of monochromatic light with the help of Newton’s ring apparatus.
9. Determination of grating element of a diffraction grating using spectrometer.
10. To determine the value of wavelength of LASER source using Grating.
11. To determine the refractive index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece.
12. Plotting of characteristic curve of a PN junction diode.
13. To draw the characteristics of a bipolar junction transistor
14. To determine the resistance of a given wire using a meter bridge.
15. To determine an unknown Low Resistance using Carey Fosters.
16. To study the characteristics of a series RC Circuit.
17. Study of RLC Circuit

**Essential books:**

* Practical Physics by C.L. Arora, S. Chand Limited
* A Complete Course in Practical Physics by B.B. Swain, Kalyani Publishers

**Course Outcomes**

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

|  |  |
| --- | --- |
| CO1 | Express the idea of calculation of acceleration due to gravity at any place using the concept of oscillatory system and simple harmonic motion. |
| CO2 | Demonstrate the working and operational technique to calculate the mechanical properties of fluid and other materials. |
| CO3 | Evaluate the voltage, current, power and characteristics behaviour of the electronic devices. |
| CO4 | Understanding the rigidity concept of solid materials. |
| CO5 | Analyzing the electrical and magnetic field measurements and their applications. |

**Course Articulation Matrix**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO2** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO3** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO4** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO5** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

# CS1401: Programming in C and Data Structures (3-0-0: 3)

Course Objectives :

1. It aims to train the student to the basic concepts of the C-programminglanguage and Datastructures.
2. This course involves a lab component which is designed to give the student hands-on experience with theconcepts.

Course Outcomes:

After the course the students are expected to be able to (this is what the exams will test) :

1. Knowing the use of function for problem solving
2. Understanding the storage location of data through pointers
3. To understand the arrangement of data
4. Solving scientific problem through programming

Module-1:

Introduction to Programming, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, Arithmetic expressions and precedence. Conditional Branching and Loops, Arrays (1-D, 2-D), Character arrays and Strings. Storage classes: local, global, static & register variables.Functions (including built in libraries), Recursion.

Module-2:

Structure and Unions , Defining structures and Array of Structures, Pointers, Pointers to functions, Double pointers,Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference,Dynamic memory management: use of malloc(), calloc(), realloc(), free().File handling: reading & writing to a file.

Module-3:

Introduction to data structures, Arrays and Row/Column major representation of Arrays, Sparse matrix, Stack: operation on stack, applications of stack. Queues: representation of queues, types of queues and application, Linked lists: Single linked lists, linked list representation of stacks and Queues, Operations on polynomials, double linked list, circular list.

**Essential books:**

* Byron Gottfried, Schaum's Outline of Programming with C,McGraw-Hill
* E. Balaguruswamy, Programming in ANSI C, TataMcGraw-Hill
* Data Structure using C by Tanenbaum, Pearson Education, 2009

Reference Books

* BrianW. KernighanandDennisM.Ritchie, TheProgrammingLanguage, Prentice Hall ofIndia

**CO-PO mapping**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CO1** | **CO2** | **CO3** | **CO4** |
| **PO1** | **√** | **√** | **√** | **√** |
| **PO2** | **√** | **√** | **√** | **√** |
| **PO3** | **√** | **√** | **√** | **√** |
| **PO4** | **√** | **√** | **√** | **√** |
| **PO5** |  |  |  |  |
| **PO6** |  |  |  |  |
| **PO7** |  |  |  |  |
| **PO8** |  |  |  |  |
| **PO9** |  |  |  | **√** |
| **PO10** |  |  |  |  |
| **PO11** |  |  |  |  |
| **PO12** |  |  |  | **√** |

# CS1501: Programming Laboratory (0-0-3: 1.5)

List of Experiments

***(At least 10 experiments should be done)***

**Experiment List:**

1. Simple computational problems using arithmetic expressions
2. Problems involving if-then-else statements
3. Iterative problems e.g. sum of series
4. 1-D Array manipulation(traversal, sorting and searching)
5. Matrix problems
6. String operations
7. Function and Recursive function
8. Implementation of pointers
9. Dynamic memory management: use of malloc(), calloc(), realloc() and free().
10. To create a stack using an array and perform (i) push operation (ii) pop operation
11. Implementation of queue operations: insertion and deletion
12. To perform the following operations on Single linked list: i) Creation ii) Insertion iii) Deletion
13. Linked list representation of stack and queue

# EE1401: Basic Electrical Engineering (2-0-0: 2)

**MODULE-I ( 7 HOURS)**

**D.C circuit analysis and network theorems:** Concept of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, source transformation, Kirchhoff’s Laws: loop and nodal methods of analysis, star delta transformation, network theorems: Thevenin’s theorem, Norton’s theorem, Superposition theorem, maximum power transfer theorem.

**MODULE-II (7 HOURS)**

**Single phase and three phase ac circuit:** AC fundamentals, 1-phase and 3-phase systems, concept of phasor, phasor representation of sinusoidally varying voltage and current, sinusoidal, square and triangular waveforms-average and effective value, form factor and peak factor ,analysis of series RLC circuits. Apparent, active and reactive powers, power triangle,power factor for single phase system. Basic principle of operation of 1-phase transformer and emf equation, star and delta connections, balanced supply and balanced load,line and phase voltage/current relation for three phase system.

**MODULE-III (6 HOURS)**

**Magnetic circuit & principle of electromechanical energy conversion:** Analogy between electric and magnetic circuit,B-H curve, magnetic circuits with DC excitation(Series and Parallel) . construction and principles of dc motor & dc generator, types, emf equation of dc machine.

**Essential books:**

* Edward Hughes (revised by Ian McKenzie Smith), “Electrical & Electronics Technology”, Pearson Education Limited. Indian Reprint 2002, 10th Edition.
* Nagrath I.J. and D. P. Kothari, Basic Electrical Engineering, Tata McGraw Hill.

**Reference Books**

* S. Parker Smith, “Problems in Electrical Engineering”, Asia Publications, 10th Edition.
* AICTE Prescribed Textbook on Basic Electrical Engineering

Available: https://ekumbh.aicte-india.org/

**Course Outcomes:**

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

|  |  |
| --- | --- |
| CO1 | Implement principles of DC network and theorems. |
| CO2 | Analyze and apply the concept of single phase & three phase AC circuits and understand the principle of operation of 1-phase transformer. |
| CO3 | Express the concept of magnetic circuit and understand DC machines operation as motors and generators. |

**Course Articulation Matrix**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 2 | 1 | 1 | 2 | 1 | - | - | - | - | 1 |
| **CO2** | 3 | 3 | 2 | 1 | 1 | 2 | 1 | - | - | - | - | 1 |
| **CO3** | 3 | 3 | 2 | 1 | 1 | 2 | 1 | - | - | - | - | 1 |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

**Program Articulation Matrix row for this Course**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **Course** | 3 | 3 | 2 | 1 | 1 | 2 | 1 | - | - | - | - | 1 |

# EE1501: Basic Electrical Engineering Laboratory (0-0-3: 1.5)

(Any 10 Nos.)

1. Introduction to various electrical symbols and basic safety precautions: Study of Voltmeter, Ammeter, Wattmeter, Energy meter, Flux meter, Frequency meter, multi-meter, variac.
2. Measurement of power consumption and determination of power factor of an Incandescent lamp, Fluorescent lamp, LED lamp and CFL lamp
3. Verification of Thevenin’s and Norton’s Theorem
4. Verification of Superposition and Maximum Power Transfer Theorem
5. Measurement of power and determination of power factor in a series RLC circuit excited by a single-phase AC supply.
6. Testing of a single-phase energy meter
7. Observation of no-load current waveform of a single-phase transformer and measurement of primary and secondary voltages, currents and power at different loads.
8. Measurement of power in a three-phase system by two wattmeter method
9. Determination of open circuit characteristics (O.C.C) of D.C shunt generator
10. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor and slip ring arrangement), and single-phase induction machine.
11. Measurement of the armature & field resistance of D.C. Machine by volt-amp method.
12. Study of BH Curve of ferromagnetic core material.

**Course Outcomes**

Upon completion of the laboratory subject the students will demonstrate the ability to:

|  |  |
| --- | --- |
| CO1 | Express the safety rules as per ISS and symbols of different electrical components and the use of various electrical instruments in the laboratory. |
| CO2 | Demonstrate the working and operational characteristics of dc generator and 1-phase transformer. |
| CO3 | Evaluate the voltage, current, power and power factor of series R-L-C circuit and study BH curve of a ferromagnetic core material. Conduct study on network theorems. |
| CO4 | Measure armature and field resistance of DC machines, identify and understand the internal structure of different machines. |
| CO5 | Analyze the connection and calibration of single phase energy meter. |

**Course Articulation Matrix**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO2** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO3** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO4** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |
| **CO5** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

**Program Articulation Matrix row for this Course**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **Course** | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 1 |

# EI1401: Basic Electronics (2-0-0: 2)

**No. Of classes: 20+ 4 Tutorial classes**

|  |  |  |
| --- | --- | --- |
| COURSE OUTCOME: After completion of course, student should be able to   1. Analyze theoperationand application of semiconductor devices. 2. Apply the fundamental of BJTs and FETs operations and characteristicsfor practical applications. 3. Apply the concepts of Feedback Amplifiers and Operational Amplifiers in different practical applications. | | |
| MODULE | CONTENT | HOURS |
| MODULE 1 | Semiconductor Devices: Introduction to Semiconductor, Semiconductor materials (Intrinsic & Extrinsic), Properties of semiconductor, Current flow in semiconductors, Carrier concentrations, Extrinsic Semiconductor (P type, N type)  P-N Junction diode: Voltage -current characteristic of a p-n Junctions, Forward and reverse Bias concept, Diode Equivalent Circuit, Load Line analysis,Applications of Diodes-Rectifiers (Half wave, Full wave- Center tap, Bridge), Clippers and Clampers | **(07**  **Hours)** |
| MODULE 2 | Bipolar junction Transistor (BJTs):- Device Structure and modes of operation, Types of BJT,Input Output Characteristic of CB, CE and CC configuration, Early Effect and Base width Modulation, BJT as a switch, and an Amplifier (Basic Concepts), Load Line analysis and Operating Point, Concept of Biasing of BJTs (Fixed Bias and Voltage divider)  JFET:- Physical Structure, Operation and Transfer and DrainCharacteristics, Pinch-off Voltage  MOSFET : Physical Structure, Operation and Characteristics,of Depletion type MOSFET, Enhancement-type MOSFET, | **(08**  **Hours)** |
| MODULE 3 | Feedback Amplifiers: - General Feedback Structure, Properties of Negative Feedback, Principles of Positive feedback.  Operational Amplifiers (OP-AMPs): - The Ideal OP-AMP, Inverting Configuration, Non-Inverting Configuration. Virtual Ground concept, OP-AMP Applications (Adder, Subtractor, Integrator, Differentiator). | **(05**  **Hours)** |
| TEXT BOOK | 1. Electronics Fundamentals and Applications, D Chattopadhyay and P.C. Rakshit, New Age International Publications. Selected portions fromchapters 2. Electronic Devices & Circuit Theory, R.L Boylestad and L.Nashelsky, PearsonEducation. | |
| REFERENCE BOOK | 1. Integrated Electronics, Millman and Halkias, TMHPublications. 2. Microelectronics Circuits, A.S Sedra, K.C. Smith, Oxford UniversityPress. 3. VLSI Design, Debaprasad Das, Oxford University Press. 4. Electrical & Electronics Measurement and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co(Pvt.) Ltd | |

CO-PO Mapping:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Name** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **Basic Electronics Engineering** | | | | | | | | | | | | | | | |
| **CO1** | 3 | 3 | 3 | - | - | - | - | - | 2 | - | - | 2 | 3 | 3 | - |
| **CO2** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | - | - | 2 | 3 | 3 | - |
| **CO3** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | - | - | 2 | 3 | 3 | - |
| **TOTAL** | 9 | 9 | 9 | 4 | - | - | - | - | 6 | - | - | 6 | 9 | 9 | - |
| **AVERAGE** | 3 | 3 | 3 | 1.3 | - | - | - | - | 2 | - | - | 2 | 3 | 3 | - |

# EI1501: Basic Electronics Laboratory (0-0-3: 1.5)

**Course Outcomes (CO):**

After completing the course, the student will be able to,

**CO1.** Analyze output in different electronics components.

**CO2.** Determine the property of P-N and Zener diode.

**CO3.** Design variety of practical circuits using Diode and FETs.

**List of experiments**

1 Familiarization with electronic components & equipment’s (Active & Passive, Multi-meters, CROs and function generators)

2 Study of the characteristics of P-N junction diode and finding dynamic resistance.

3 Study of the characteristics of Zener diode.

4 Construction of half-wave rectifier and full wave rectifier circuits & study of their output waveforms by CRO and calculation of efficiency and ripple factor.

5 Study of the output characteristics of a Common Emitter Transistor

6 Construction of clipper circuits & study of their output waveforms of positive clipper, negative clipper and two level clipper by CRO.

7 Design, setup and plot the frequency response of Common Source JFET/MOSFET amplifier and obtain the bandwidth.

8 Construction of clamper circuits & study of their output waveforms of positive clamping, negative clamping by CRO.

**MAPPING OF COs, POs AND PSOs:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO/ PO &PSO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 3 | 3 | 1 | 1 | 1 | - | - | - | 3 | 3 | - | 2 | 3 | 3 | - |
| **CO2** | 3 | 3 | 3 | 2 | 1 | - | - | - | 3 | 3 | - | 2 | 3 | 3 | - |
| **CO3** | 3 | 3 | 3 | 2 | 1 | - | - | - | 3 | 3 | - | 2 | 3 | 3 | - |
| **TOTAL** | 9 | 9 | 7 | 7 | 3 | - | - | - | 9 | 9 | - | 6 | 9 | 9 | - |
| **AVERAGE** | 3 | 3 | 2.3 | 1.6 | 1 | - | - | - | 3 | 3 | - | 2 | 3 | 3 | - |

# IP1401: Basic Civil Engineering (2-0-0: 2)

MODULE-I

Introduction to Civil Engineering – Types of buildings as per NBC, Selection of site for buildings, Components of a residential and Industrial buildings with their functions, Computation of plinth area, carpet area.

Surveying – Principle and objectives, Instruments used, Horizontal measurements, Ranging (direct & In-direct ranging). Leveling – Definition, Principles, Instruments, problems on leveling, Modern surveying instruments– Total station, GPS (Brief discussion).

Module II

Building Materials – Bricks – properties and specifications, Cement – Types, properties, grades, types of cement and uses, Cement mortar – Constituents, Preparation. Concrete – PCC and RCC, Grades. Steel – Use of steel in buildings, types.

Building Construction – Foundations, Classification, Bearing Capacity of Soil and related terms (Brief discussion), Masonry Works – classifications, definition of different technical terms, Brick masonry – types, bonds, general principle. Floors – function, types, flooring materials (brief discussion), Plastering and Painting – objectives, types, preparation and procedure of application.

Irrigation & Water Supply Engineering – Introduction, Types of Irrigation, different types of hydraulic structures, dam and weirs, types of dam, purpose and functions.

Module-III

Introduction to Transportation engineering, Transportation modes, Highway engineering – historical development, highway planning, classification of highway, geometric design parameters (brief discussion only). Railway Engineering – cross section of rail track, basic terminology

Airport engineering – development, types, definition, basic terminologies. Traffic engineering – traffic characteristics, traffic studies, traffic operations (signals, signs, markings).

Basic Infrastructure services – air conditioning & purpose, fire protection & materials, Ventilation, necessity & functional requirements, Lifts, Escalators.

**Essential books:**

* Basic Civil engineering, Gopi, S., Pearson Publication
* Basic Civil Engineering, Bhavikatti, S. S., New Age.
* Building Construction, Sushil Kumar, Standard Publishers Distributors
* Surveying and Levelling by R. Subramanian, Oxford University Press

**Reference Books:**

* Basic Civil Engineering, M.S. Palanichamy, McGraw Hill.
* Basic Civil and Environmental Engineering, C.P. Kausik, New Age.
* Construction Technology, Chudley, R., Longman Group, England.
* Surveying Vol-1 by R Agor, Khanna Publishers.
* Building Material and Construction, G C Sahu, Joygopal Jena, McGrow Hill.
* Engineering Materials, S.C. Rangwala, Charotar Publishing House.
* American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application.

**COURSE OUTCOMES:**

**CO1:** Analyzing the fundamental aspect of building planning.

**CO2:** Understanding the general aspect of surveying.

**CO3:** Explain about building material and building constructions.

**CO4:** Describe about Irrigation Structures and functions.

**CO5:** Judgment on the transportation modes and planning.

**CO6:** Understanding the Airport and Traffic Engineering.

# IP1501: Engineering Graphics & Design Laboratory (0-0-3: 1.5)

**Course Objectives:**  
1. Know and understand the conventions and the methods of engineering drawing.  
2. Construct basic and intermediate geometry and comprehend the theory of projection.

3. Improve their visualization skills so that they can apply these skills in developing new products

4. Prepare Multiview orthographic projections of objects by visualizing them in

different positions.

5. Convert 3D views to orthographic views

6. Use computer software for engineering drawing.

**Course Contents:**

**Module I**

**Introduction:** Drawing instruments and their uses, Types of lines, Lettering, General rules for dimensioning, Geometrical constructions using instruments.

**Computer Graphics:** Introduction to AutoCAD basic commands, Advantages of CAD, Cartesian and Polar Co-ordinate system, Absolute and relative co-ordinates, Basic editing commands, Lettering and Dimensioning, Creating two-dimensional drawing with dimensions.

**Orthographic Projection:** Methods of projection, Principles of Orthographic projection, First angle versus third angle of projection, Six views of any object, Conventions.

**Projection of Points:** Projections of points, Situated in different quadrants.

**Module II**

**Projections of Lines:** Projections of a line parallel to one of the reference planes and inclined

to the other, line inclined to both the reference planes, Traces.

**Projections of Planes:** Projections of a plane perpendicular to one of the reference planes

and inclined to the other, Oblique planes.

**Projections of Solids:** Projections of solids whose axis is parallel to one of the reference

planes and inclined to the other, axis inclined to both the planes.

**Sections of Solids:** Sectional planes, Sectional views - Prism, pyramid, cylinder and cone,

true shape of the section.

**Module III**

**Development of Surfaces:** Development of lateral surfaces of right solids – cube, prisms,

cylinders, pyramids, cones.

**Intersection of surfaces:** Methods of determining the line of intersection between surfaces

of two interpenetration solids in simple positions – Intersection of two prisms, two cylinders,

cylinder and prism, cone and cylinder, cone and prism, two cones.

**Isometric Views:** Isometric axes, Isometric lines, Isometric Planes, Isometric scale, Isometric

Views, Isometric projections.

**Essential Books/Reference Books:**

* A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi.
* Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand.
* A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi.
* A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi.
* Engineering Drawing by B. Agrawal and C M Agrawal, Tata McGraw Hill, New Delhi

**Course outcomes:**  
CO1: To interpret Orthographic, Isometric and Perspective views of objects.  
CO2: Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.

CO3: Understand the intersection, and development of surface of body.

CO4: Apply auxiliary or sectional views to represent engineered parts most practically. CO5: Develop 3D Isometric View from 2D orthographic views.  
CO6: Basic learning of software tools to draw basic figures.

# MS1401: Basic Mechanical Engineering (2-0-0: 2)

**COURSE OUTCOMES**

**CO1:** Comprehending the Law of Thermodynamics

**CO2:** Being aware of how crucial thermodynamics is to IC engines, power plants, refrigerators, and Heat Pump

**CO3**: Being aware of fluid mechanics and heat transfer concepts

**CO4**: Recognizing the functions of Engineering materials

**CO5**: Have a fundamental understanding of welding, Casting, Forming and other manufacturing techniques.

**CO6**: Recognizing fundamental power transfer mechanisms and aware of the fundamental robotics system

**MODULE-I (9 classes)**

**Thermodynamics:** Systems, Properties, Process, State, Cycle, Internal energy, Enthalpy, Zeroth Law, First law and Second Law of Thermodynamics, Basic Concept Entropy, Properties of ideal gas, Properties of pure substances, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables. Related numerical.

**MODULE-2 (8 classes)**

**Application of Thermodynamics:** Single stage air compressor, Steam Power Plant, I.C. Engines (Brief Description on working principles with Schematic diagrams only)

**Elements of Fluid Mechanics and Heat Transfer**

Properties used in Fluid Mechanics, Fluid Statics, Kinematics and Dynamics (Concepts only), Heat transfer and Classifications (Concepts only)

**MODULE-III (9 Classes)**

**Introduction to Manufacturing:** Classification of engineering materials, Material Properties, Manufacturing processes: Welding, Casting, Forming (Basics only)

**Basic Power transmission devices:** Belt, Gear drives, clutch, brakes. (Working principle only)

**Introduction to Robotics:** Robot anatomy, Joints and links and common robot configurations.

**Essential books**

* Basic Mechanical Engineering by Pravin Kumar, Pearson
* Basic Mechanical Engineering by A R Israni, P K Shah, BS Publications
* Text book of Elements of Mechanical Engineering, S T Murthy, Universities press
* Basic and applied Thermodynamics by P. K. Nag, Tata McGraw Hill

**Reference books**

* Basic Mechanical Engineering by.D. Mishra, P. K Parida, S.S.Sahoo, India Tech Publishing company
* Elements of Mechanical Engineering by J K Kittur and G D Gokak,Willey
* Basic Mechanical Engineering by Basant Agrawal, C M Agrawal,Willey
* Engineering Thermodynamics by P. Chattopadhaya, Oxford University Press

# MS1403: Engineering Mechanics (3-0-0: 3)

**Course Contents**

**Module - I (12 Hours)**

Concurrent forces on a plane: Composition, resolution and equilibrium of concurrent coplanar forces, method of moment. General case of forces on a plane, Composition and equilibrium of forces in a plane. Plane truss analysis, (method of joints and method of sections), equilibrium of ideal systems.

Friction: Fundamentals of friction and Problems involving friction.

**Module-II (10 Hours)**

Parallel forces on a plane: General case of parallel forces, center of parallel forces and center of gravity, centroid of plane, composite figures and curves, Theorems of Pappus.

Moments of inertia: Plane figure with respect to an axis in its plane and perpendicular to the plane, Polar moment of inertia*,* parallel axis theorem

Virtual Work: Principles and applications

**Module - III (14 Hours)**

Rectilinear translation: Kinematics, principle of dynamics, D Alembert’s Principle, Principle of work and energy for a particle and a rigid body in plane motion, Conservation of energy, Principle of impulse and momentum for a particle and a rigid body in plane motion, Conservation of momentum, System of rigid bodies, Impact, direct and central impact, coefficient of restitution.

Curvilinear translation: Kinematics, equation of motion, projectile, D Alembert’s principle of curvilinear motion. Kinematics of rotation of rigid body.

**Essential Book:**

* Engineering Mechanics: S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, 5th Edition,2017 McGraw Hill.

**Reference books**

* Engineering Mechanics, Static and Dynamics, J. L. Meriam and L. G. Kraige, 9th Edition,2021, John Wiley & Sons, Inc.
* Fundamental of Engineering mechanics, S Rajesekharan & G Shankara Subramanium, 3rd Edition, 2017, S. Chand .
* Engineering mechanics: K. L. Kumar and Veenu Kumar, 4th Edition,2017, Tata MC Graw Hill.

Upon completion of the subject the students will be able to:

|  |  |
| --- | --- |
| CO1 | Analyze objects in static equilibrium including the determination of reactions, forces and moments and enriching fundamental concepts of friction and demonstrate the analytical skills to solve the problems involving friction. |
| CO2 | Assimilate the knowledge for determination of centroid and second moment of area of sections and their engineering applications and use of virtual work method to analyze static force in a system. |
| CO3 | Evaluate the work done by forces, the energy transferred from one object to other and using principle of work and energy conservation for realistic (/Practical) engineering problems and apply the principle of dynamics to analyze the motion of rigid bodies under rectilinear curvilinear translation |

# MS1501: Workshop & Digital Manufacturing Laboratory (0-0-3: 1.5)

**Introduction**: workshop, different shops, brief about digital manufacturing

**Fitting**: Knowledge of hand tools: V-block, Marking Gauge, Files, Hack Saw, Drills, Taps,

Job Preparation: Paper weight, male and females joints etc.

**Welding**: Study of electric arc and Gas welding tools & equipments,

Job preparation: Butt Joint, Lap Joint, T joint & L- joint.

**Machining**: Introduction to different machine tools: Lathe , Shaper and milling machines.

Job Preparation: one job involving different operation like turning, grooving, facing, taper turning, and threading using machine tools

Study and demonstration of components and operation of 3D printer, 3D scanner, CNC machine tool, robot used in digital manufacturing

**Essential books**

* Elements of Workshop Technology, Vol. I and II by Hajrachoudhary, KhannaPublishers.
* Workshop Technology by W. A. J. Chapman, Viva Books.
* Workshop Manual by Kannaiah/ Narayana, Scitech.

**Course Outcomes:** Upon completion of the subject the students will be able to :

**CO1**- Acquire Knowledge on different types of hand tool, measuring instruments and machine tools are used in different shops of workshop.

**CO2**- Know about different types of operations and joints performed in different shops i.e. in Fitting and welding.

**CO3**- Acquire skills for the preparation of different types of jobs Carpentry/fitting/smithy shops by using different types of hand tools and machine tools.

**CO4**- Know about the different digital manufacturing processes and equipment used in that.

**CO5**- Understand the importance of safety precaution in different shops.

# BH1442: Mathematics – II (3-0-0: 3)

***Module 1:* Differential Equations and different methods of solutions *(10 Lectures)***

First order ODEs: Exact, integrating factors, linear and Bernoulli equations. Second order ODEs: homogeneous linear ODEs with constant coefficients, Euler-Cauchy equations, non-homogeneous ODEs, Applications of ODE to electric circuits.

Series solution of differential equations (excluding Frobenius method), Legendre equations and Legendre polynomials.

***Module 2:* Fourier Series and Laplace Transform *(8 Lectures)***

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

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 3:* Calculus of Complex Functions *(12 Lectures)***

Complex valued function, differentiation, analytic function, Cauchy-Riemann equations, harmonic and conjugate harmonic functions, elementary analytic functions (exponential, trigonometric, hyperbolic and logarithm) and their properties.

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.

**Essential books**

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

**Reference Books:**

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

**COURSE OUTCOME**

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

|  |  |
| --- | --- |
| ***CO 1*** | Classify different types of ODEs of 1st order and 2nd order and solve different mathematical and physical problems using appropriate methods. |
| ***CO 2*** | Apply Laplace transform methods to solve the differential equations and integral equations; expand different functions in forms of Fourier series. |
| ***CO 3*** | Equip with the understanding of fundamental concept of complex variables, demonstrate accurate and efficient use complex analysis. |
| ***CO 4*** | Obtain the skill of contour integration to evaluate complicated real integrals via residue calculus. |