# PRIYADARSHINI COLLEGE OF ENGINEERING

(Recognised by A.I.C.T.E. New Delhi & Govt. of Maharashtra Affiliated to R.T.M. Nagpur University)
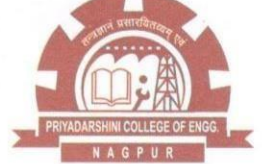
Near C.R.P.F. Campus, Hingna Road, Nagpur - 440 019 (Maharashtra) India

Phone : 07104 - 299648, Fax : 07104-299681

E-mail : principal.pce.ngp@gmail.com • Website: www.pcenagpur.edu.in

AICTE ID No. 5435581; DTE CODE No. 4123; UNIVERSITY CODE No. 278

Accredited with Grade A+by NAAC

**AN AUTONOMOUS INSTITUTE**

**FIRST YEAR ENGINEERING**

**CURRICULUM**

**UNDER GRADUATE PROGRAMME**

**B. Tech First Year**

**(Mechanical Engineering/Civil Engineering/Electrical Engineering /Electrical & Power Engineering/AeronauticalEngineering)**

**WITH EFFECT FROM THE ACADEMIC YEAR 2023-2024.**

## LOKMANYA TILAK JANKALYAN SHIKSHAN SANSTHA

Lokmanya Tilak Bhavan, Laxmi Nagar, Nagpur - 440 022. Maharashtra, INDIA. Tel : +91-712-2230665, 2245121. Fax No. : + 91-712 2221430. Website : www.ltjss.net

# SCHEME OF EXAMINATION w.e.f. 2023-24 onwardsFIRST

## SEMESTER B. TECH. (ME/CV/EE/EP/AE)

| Sr. No. | Course Code | Course Category | BOS/ Dept | Course Name | Contact Hours | | | | Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Theory | | Practical | | |
| | | | | | L | T | P | Credits | CE | ESE | CE | ESE | |
| 1 | 23UFY1A1T | BSC | ASH | Basic calculus & differential equations | 3 | 1 | 0 | 4 | 40 | 60 | -- | -- | 100 |
| 2 | 23UFY1A2T | BSC | ASH | Engineering Physics | 3 | 0 | 0 | 3 | 40 | 60 | | | 100 |
| 3 | 23UFY1A2P | BSC | ASH | **Lab:** Engineering Physics | 0 | 0 | 2 | 1 | | | 25 | 25 | 50 |
| 4 | 23UFY1A3T | ESC | CV | Engineering Mechanics | 3 | 0 | 0 | 3 | 40 | 60 | | | 100 |
| 5 | 23UFY1A3P | ESC | CV | **Lab**: Engineering Mechanics | 0 | 0 | 2 | 1 | | | 25 | 25 | 50 |
| 6 | 23UFY1A4T | ESC | ME | Computer Aided Graphics. | 1 | 0 | 0 | 1 | 20 | 30 | | | 50 |
| 7 | 23UFY1A4P | ESC | ME | **Lab**: Computer AidedGraphics | 0 | 0 | 2 | 1 | | | 25 | 25 | 50 |
| 8 | 23UFY1A5P | ESC | ME | **Lab:** Engineering Workshop | 0 | 0 | 2 | 1 | -- | - | 25 | 25 | 50 |
| 9 | 23UFY1A6T | AEC | ASH | Communication skills | 1 | 0 | 0 | 1 | 20 | 30 | | | 50 |
| 10 | 23UFY1A6P | AEC | ASH | **Lab:** Communicationskills | 0 | 0 | 2 | 1 | | | 25 | 25 | 50 |
| 11 | 23UFY1A7P | SEC1 | ASH | Skill Enchancement in Analytical Techniques | 0 | 1 | 2 | 2 | -- | - | 25 | 25 | 50 |
| 12 | 23UFY111P | CC1 | ASH | Liberal Learning Course: Yoga-1 | -- | -- | -- | 2 | -- | -- | 50 | -- | 50 |
| | 23UFY112P | | | Liberal Learning Course: Physical Education-1 | | | | | | | | | |
| | 23UFY113P | | | Liberal Learning Course:Music-1 | | | | | | | | | |
| | 23UFY114P | | | Liberal LearningCourse:NSS-1 | | | | | | | | | |
| | | | | | 11 | 2 | 14 | 21 | 160 | 240 | 200 | 150 | 750 |

## SECOND SEMESTER B. TECH. (ME/CV/EE/AE)

| Sr. No. | Course Code | Course Category | BOS/ Dept | Course | Contact Hours | | | | Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Theory | | Practical | | |
| | | | | | L | T | P | Credits | CE | ESE | CE | ESE | |
| 1 | 23UFY2A1T | BSC | ASH | Advanced Calculus & Statistics | 3 | 1 | 0 | 4 | 40 | 60 | -- | -- | 100 |
| 2 | 23UFY2A2T | BSC | ASH | Engineering Chemistry | 3 | 0 | 0 | 3 | 40 | 60 | -- | -- | 100 |
| 3 | 23UFY2A2P | BSC | ASH | **Lab:** Engineering Chemistry | 0 | 0 | 2 | 1 | -- | -- | 25 | 25 | 50 |
| 4 | 23UFY2A3T | ESC | CSE | Computer Programming | 2 | 0 | 0 | 2 | 20 | 30 | | | 50 |
| 5 | 23UFY2A3P | ESC | CSE | **Lab:** ComputerProgramming | 0 | 0 | 2 | 1 | -- | -- | 25 | 25 | 50 |
| 6 | 23UFY2A4T | ESC | EE | Basics of Electrical & Electronics Engineering | 3 | 0 | 0 | 3 | 40 | 60 | -- | -- | 100 |
| 7 | 23UFY2A4P | ESC | EE | **Lab:** Basics of Electrical & Electronics Engineering | 0 | 0 | 2 | 1 | -- | -- | 25 | 25 | 50 |
| 8 | 23UFY221T | PCC | ME | Basic of Mechanical Engineering | 2 | 0 | 0 | 2 | 20 | 30 | -- | -- | 50 |
| | 23UFY222T | | CV | Building Materials & Elements | | | | | | | | | |
| | 23UFY223T | | EE | Renewable Energy Sources **(EE/EP)** | | | | | | | | | |
| | 23UFY224T | | AE | Aeronautical Introduction to aeronautical Engineering | | | | | | | | | |
| 9 | 23UFY2A5T | IKS | ASH | Indian Traditionalknowledge | 2 | 0 | 0 | 2 | 20 | 30 | -- | -- | 50 |
| 10 | 23UFY2A7P | SEC2 | ASH | Skill Enchancement in Instrumental Techniques | 0 | 1 | 2 | 2 | -- | -- | 25 | 25 | 50 |
| 11 | 23UFY211P | CC2 | ASH | Liberal Learning Course: Yoga-2 | -- | -- | -- | 2 | -- | -- | 50 | -- | 50 |
| | 23UFY212P | | | Liberal Learning Course: Physical Education-2 | | | | | | | | | |
| | 23UFY213P | | | Liberal Learning Course:Music-2 | | | | | | | | | |
| | 23UFY214P | | | Liberal Learning Course:NSS-2 | | | | | | | | | |
| | | | | | 15 | 2 | 8 | 23 | 180 | 270 | 150 | 100 | 700 |



**Principal**

**Dean Academic**

**Course Title- Basic Calculus and Differential Equations**          **Semester -I**
**Course Code- 23UFY1A1T**                                          **Course Category: BSC**
**Teaching Scheme: L-T-P**                                          **Total Credits: 3+1**
                    **3 -1- 0**

**Prerequisites:** Basic knowledge of fundamentals of mathematical concepts, matrices, differentiation, Integration.

**Course Objectives:**

➢ The objective of this course is to familiarize the budding engineers with techniques in linear Algebra, Calculus and Differential Equations.

➢ It aims to equip the students with standard concept and tools, that will serve them well towards tackling more advance level of mathematics and applications that they would find useful in their disciplines.

**Course Outcome:**

On successful completion of the course, the students will learn:

**CO1**:To apply knowledge of matrices and linear algebra in a comprehensive manner.

**CO2:** To solve engineering problem by using knowledge of differentiation.

**CO3:** Determine the derivatives of functions of several variables and develop the mathematical equation.

**CO4:** To analyse sequence and series on basis of types and their convergence

**CO5:** To distinguish and solve differential equation that model physical process

**CO6:** To evaluate higher order differential equation used in various engineering field.

## COURSE   CONTENT:

### UNIT I: MATRICES

Inverse of a matrix by Partitioning method, Rank of a matrix, Consistency of linear system of non-homogeneous equations, Homogeneous system of Linear equations, Symmetric, Skew-symmetric and Orthogonal matrices, Linear and Orthogonal transformations, Cayley-Hamilton theorem.      **[6 Hours]**

### UNIT II: DIFFERENTIAL  CALCULUS

Successive differentiation: Leibnitz's Rule,Taylor's and Maclaurin's series for function of one variable,Indeterminate forms and L'Hospital's Rule, Maxima and Minima for function of one variable.

**[8 Hours]**

### UNIT III: MULTIVARIABLE  CALCULUS

Functions of several variables, First and Higher order partial derivatives, Euler's theorem, Chain rule and Total differential coefficient, Jacobians, Maxima and Minima for function of two variables.

**[8 Hours]**

### UNIT IV: SEQUENCE  AND  SERIES

Sequence, types of sequence, test of convergence of sequences, Cauchy sequence, infinite series, power series, Alternating series, tests of convergence and absolute convergence of series.

**[6 Hours]**

### UNIT V: FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS

Exact differential equations,Linear,Bernoulli's differential equations,Equations not of first degree: equation Solvable for p, Solvable for y, Solvable for x and Clairaut's type.

**[6 Hours]**

### UNIT VI: ORDINARY  DIFFERENTIAL  EQUATIONS  OF  HIGHER  ORDER

Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy-Euler equation, Cauchy-Legendre equation and its application.

**[8 Hours]**

**Text Books:**

(1) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.

(2) H.K Dass, Rama Verma, Rajnish Verma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Mathematics-I, Mathematics-II, S. Chand.

(3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

**Reference Books:**

(1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006. (2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11thReprint, 2010.

(2) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

| | |
|---|---|
| **Course Title: Engineering Physics** | **Semester I** |
| **Course Code: 23UFY1A2T** | **Course Category: BSC** |
| **Teaching Scheme: L – T – P** | **Total Credits: 3** |
| **3 – 0 – 0** | |

**Prerequisites:** Students should have basic knowledge of optics, laws of mechanics, electric and magnetic fields.

**Course Objectives:**

1. To introduce phenomena and applications of Modern Physics .

2. To demonstrate working and applications of various optoelectronic devices.

3. To provide a strong foundation in mathematical derivation and numerical problems.

**Course Outcomes:**

Students will be able to

**CO1**. Apply concepts in interference and diffraction to relevant engineering applications.

**CO2.** Apply the concepts of Quantum Mechanics and analyze relevant phenomena.

**CO3**.Classify solids on the basis of band theory and study of semiconductor devices along with their applications.

**CO4**. Describe quantum transitions and apply it to the working of lasers.

**CO5.** Apply the basic concepts of motion of charged particles in electric and magnetic. fields with its applications in electron optic devices and CRO.

**CO6.** Describe optical fiber structure, different modes, types and its engineering applications.

COURSE   CONTENT:

## UNIT I: WAVE OPTICS

Interference in thin films, Plane parallel thin film, Wedged shape thin film, Newton's rings,
Anti-reflection coating, Advanced Applications. Fraunhoffer diffraction & Fresnel diffraction, Diffraction grating,

resolving power of grating and its expression.                                                    **[6 Hours]**

## UNIT II QUANTUM MECHANICS

Planck's Hypothesis, Einstein's extension, Properties of Photons, Compton Effect, Wave-particle duality, de-Broglie Hypothesis.Wave function $\Psi$ and normalization condition, concept of wave packets, Heisenberg Uncertainty Principle. Schrodinger wave equation (time dependent and time independent), Application to one dimensional infinite potential well.Quantumn Computing: Operators, Eigen value and Eigen Function, Bra and Ket notations, Bits and Qubits.                                                    **[8 Hours]**

## UNIT III SEMICONDUCTOR PHYSICS

Basic idea of free electron theory of metals, expression of conductivity of a metal. Formation of energy bands in Solids. Classification of solids on the basis of energy band diagram, concept of Fermi energy, Fermi level and Fermi Dirac Distribution function.Types of Semiconductor, P-N junction Diode- Energy band diagram in Forward bias and Reverse bias, V-I Characteristics of P-N junction Diode, Zener Diode, LED. Transistors- Types and Characteristics.
**[8 Hours]**

## UNIT IV LASERS

Three quantum mechanical processes, Conditions for light amplification, Metastable state, Population inversion, Pumping and its types, Pumping schemes: Three level and Four level. Optical resonator, Laser beam characteristics, Coherence and its types, Ruby laser and He-Ne laser, Applications.  **[6 Hours]**

## UNIT V ELECTRON OPTICS

 Motion of charged particle in uniform electric and magnetic fields, Velocity selector, Bethe's law of electron refraction, Electrostatic lens. Electro-optic devices: Cathode Ray Oscilloscope: Block Diagram, Function & working of each block, applications, Bainbridge Mass Spectrograph                                                    **[8 Hours]**

## UNIT VI OPTICAL FIBER

Optical fibers: Structure and Propagation by total internal reflection, Acceptance angle, Numerical Aperture, Modes of propagation in fiber, classification of Optical Fiber based on Modes of propagation, refractive index and material.Attenuation and dispersion, Applications of optical fiber as Sensors and Fiber optic communication system.
                                                    **[6 Hours]**

**Text books:**

**1**.A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication.
**Reference books:**

**1.** P. M. Mathews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata Mc Graw Hill(1977).

**2.**J. L. Powell and B. Crasemann, Quantum Mechanics, Narosa Publishing House (1993).

**3.**Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).

**4.**A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).

**5.** Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R.Resnick, Wiley and Sons.

**6.** Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016).

**7.** D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi

**8.** L.I. Schiff, Quantum Mechanics, TMH Publications.

**9.** David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, JohnWiley and Sons (2017).

**10.** Quantumn Mechanics, Theory and Applications, 3$^{rd}$ Edition, A.K. Ghatak and S. Lokanathan, Macmillan India Ltd. (1984).

**11.** Quantumn computing for Computer Scientists, N. S. Yanofsky and M. A. Mannucci., Cambridge University Press. (2008).

| | |
|---|---|
| **Course Title: Lab-Engineering Physics** | **Semester I** |
| **Course Code: 23UFY1A2P** | **Course Category: BSC** |
| **Teaching Scheme: L – T – P** | **Total Credits: 1** |
| **0 – 0 – 2** | |

## LIST OF EXPERIMENTS: (PERFORM MINIMUM 8 EXPERIMENTS)

1. Determination of Radius of curvature of a plano convex lens by Newton's Rings.

2. Determination of Planck's constant by using LEDs.

3. Determination of Energy gap of semiconductor / thermistor.

4. Study of V-I characteristics of PN junction diode.

5. Study of Diode rectifier.

6. Study of V-I characteristics of Zener diode.

7. Study of V-I Characteristics of Light Emitting Diodes.

8. Study of V-I characteristics of PNP/NPN transistor in CB and CE mode.

9. Calibration of Time Base circuit of C.R.O. and determination of frequency of electrical signals.

10. Determination of phase of electrical signals using C.R.O..

11. Determination of AC and DC voltage using C.R.O.

12. Demonstration Experiment : Determination of wavelength of monochromatic light by diffraction grating using Laser source.

13. Virtual Lab Experiment

**Innovative Experiments**

1. To determine refractive indices of Quartz Prism using Sodium Vapour lamp by Birefringence method.

2. To determine refractive index of ordinary Glass prism using Mercury vapour lamp.

**Text books:**

**1**.A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication.

**Reference books:**

**1.** P. M. Mathews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata Mc Graw Hill(1977).

**2.**J. L. Powell and B. Crasemann, Quantum Mechanics, Narosa Publishing House (1993).

**3.**Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).

**4.**A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).

5. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R.Resnick, Wiley and Sons.

6. Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016).

7. D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi

8. L.I. Schiff, Quantum Mechanics, TMH Publications.

9. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, JohnWiley and Sons (2017).

10. Quantum Mechanics, Theory and Applications, 3$^{rd}$ Edition, A.K. Ghatak and S. Lokanathan, Macmillan India Ltd. (1984).

11. Quantum computing for Computer Scientists, N. S. Yanofsky and M. A. Mannucci., Cambridge University Press. (2008).

**Course Title: Engineering Mechanics**　　　　**Semester I**
**Course Code: 23UFY1A3T**　　　　**Course Category: ESC**
**Teaching Scheme: L – T – P**　　　　**Total Credits: 33 – 0**
　　　　　　　　　　　　 **– 0**

### Course Objectives:

1. To identify the basic concept of Mechanics and able to solve problems related with equilibrium of plane force system.

2. To analyze pinned jointed Truss frame using different methods.

3. To examine the properties of surface like centroid and moment of inertia.

4. To determine dynamic variables by applying kinetics of Particle, Work energy method and linear impulse momentum method.

## COURSE OUTCOMES:

On successful completion of the course the students will be able to

1. Illustrate the concept of force, moment and apply the concept of mechanics for solving problems.
2. Apply the concept of equilibrium in two- and three-dimensional systems with the help of free body diagram.
3. Correlate real life application to specific type of friction and estimate required force to overcome Friction.
4. Understand the properties of surface and can find centroid and moment of inertia.
5. Illustrate different types of motions and apply the principles of dynamics to solve the various engineering problems of particle.
6. Analyse body in motion using force and acceleration,work-energy,impulse-momentum principles.

## COURSE CONTENT:

### UNIT I: GENERAL FORCE SYSTEM

Classification of force Systems, Principle of transmissibility, Composition and Resolution of Forces. Moment of force about a point and about an axis, Couple, Varignon's Theorem, Force couple system. Distributed Forces in plane

**Resultant:**
Resultant of Coplanar and Non coplanar force system (3D force system), Concurrent forces, parallel forces and non-concurrent Non-parallel system of forces　　　　　　　　　　　　　　**[08 Hours]**

## UNIT II: EQUILIBRIUM OF COPLANAR FORCE SYSTEM

Free body Diagrams, Equations of Equilibrium of Coplanar concurrent and non concurrent force system, General spatial force system, Types of Supports, Types of Beams, Types of Loads.

**Analysis of Plane Trusses:** Analysis of plane trusses by using Method of Joints and Method of Sections

**[08 Hours]**

## UNIT III: FRICTION

Definition of friction, Types of Friction, Coulomb's laws of Friction, Plane Friction and Belt Friction. Application to problems involving Wedges, Ladders.

**Virtual Work Method:**

Principle of Virtual Work, Application to beams and Frames                 [**06 Hours**]

## UNIT IV: CENTROID AND MOMENT OF INERTIA

Definition of centroid, centre of gravity, radius of gyration, moment of inertia and polar moment of inertia. Centroid of simple figures from first principle, centroid of composite sections, Area moment of inertia, moment of inertia of plane sections from first principles, Theorem of moment of inertia, moment of inertia of standard sections and composite sections.                                 **[08 Hours]**

## UNIT V: KINEMATICS OF PARTICLE

Motion of a particle with variable acceleration, General curvilinear motion. Tangential & Normal component of acceleration, Motion curves (a-t. v-t, s-t curves), Projectile motion

**Kinetics of a Particle:**

Force and Acceleration:-Introduction to basic concept, D'Alemberts Principle, Concept of Inertia force, Equation of dynamic equilibrium, Newton's second law of motion.                 **[06Hours]**

## UNIT VI: WORK AND ENERGY

Work energy Principle for a particle in motion, Application of Work-Energy principle to a system consists of

connected masses and Springs.

**Impulse and Momentum:**

Principle of linear impulse and momentum. Impact and collision: Law of conservation of momentum, Coefficient of Restitution. Direct Central Impact and Oblique Central Impact. Loss of Kinetic Energy in collision of inelastic bodies.                                    **[06 Hours]**

**Suggested Self Readings:**

### Text Books
1. Engineering Mechanics, D.S. Bedi, Khanna Book Publishing Co. (P) Ltd., Delhi
2. Engineering Mechanics, R. S. Khurmi, S.Chand Publishing
3. A Textbook of Engineering Mechanics, R.K. Bansal, Laxmi Publications
4. Engineering Mechanics, S.S. Bhavikatti, K.G. Rajashekarappa

### Reference Books
1. Engineering Mechanics, Sharma, Pearson
2. Engineering Mechanics: F.L.Singer,(Harper & Row Publication)
3. Engineering Mechanics: Timoshenko & Young,TataMcGraw Hill
4. Engineering Mechanics: Bear Johnston,TtaMcGraw Hill
5. Engineering Mechanics: I.H.Shames,Phi,Pvt.Ltd
6. Engineering Mechanics:R.C.Hibbeler
7. Engineering Mechanics: A.K.Tayal,Umesh Publications
8. Engineering Mechanics: Basudeb Bhattacharya,(Oxford University press)

**Course Title:** Lab Engineering Mechanics      **Semester I**
**Course Code** : **23UFY1A3P**      **Course Category: ESC**
**Teaching Scheme: L – T – P**      **Total Credits: 10 – 0**
         **– 2**

**Course Objectives:**
1. To perform practicals based on concepts related to engineering mechanics
2. To illustrate working of lifting machine

## COURSE OUTCOMES:

On successful completion of the course the students will be able to

1. Prove the concepts related to engineering mechanics.
2. Calculate lifting machine parameters.

## LIST OF EXPERIMENTS:
1. Determination of reaction at the supports of simply supported beam.
2. Determination of forces in the member of the Jib crane
3. Determination of Coefficient of Friction by inclined plane set up
4. Determination of Coefficient of Friction by Coil friction set up
5. Determination of Moment of inertia of a Fly Wheel
6. Determination of Law of Machine and Efficiency for single purchase crab winch
7. Determination of Law of Machine and Efficiency for Double purchase crab winch

8. Determination of Law of Machine and Efficiency for Differential axle and wheel.

9. Determination of forces in the member of Shear leg apparatus.

**Suggested Self Readings:**

**Text Books**

1    A Textbook of Engineering Mechanics, R.K. Bansal, Laxmi Publications
2    Engineering Mechanics, S.S. Bhavikatti, K.G. Rajashekarappa

**Reference Books**

1    Engineering Mechanics: F.L.Singer,(Harper & Row Publication)
2    Engineering Mechanics: Timoshenko & Young,TataMcGraw Hill

| | |
|---|---|
| **Course Title:  Computer Aided Graphics** | **Semester:     I** |
| **Course Code:  23UFY1A4T** | **Course Category: ESC** |
| **Teaching Scheme: L – T – P** | **Total Credits:1** |

**1 – 0 – 0**

**Prerequisites:** Students must aware about drawing of geometrical entities.

**Course Objectives:** To acquire imagination and visualization skills to interpret data and convert it into technical drawings for effective communication and aware students about CAD software.

**Course Outcomes:**  After the completion of the course the student will be able to

| | |
|---|---|
| CO1 | **Construct** curves and draw the projections of points and straight lines located in first quadrant. |
| CO2 | **Interpret** multiview orthographic projections of different planes and solids by visualizing them in different positions and draw sectional views and develop surfaces of a given object. |
| CO3 | **Convert** pictorial view to orthographic views and prepare isometric drawings using the principles of isometric projection to visualize objects in three dimensions. |
| CO4 | **Practice** the use of CAD software tools to draw multiview orthographic projections and solid models of objects. |

## COURSE  CONTENT

### UNIT I

*a)  Introduction to Engineering Drawing*: Definition, types of drawings, drawing instruments, sheet layouts, lettering, dimensioning, scales, geometric construction methods.

*b) Engineering Curves:* Classification and applications of Engineering Curves, Construction of *Curves-I* (Ellipse, Parabola) by Rectangle Method and *Curves-II* (Cycloids and Archimedean Spiral).

*c) Theory of Projection*: Projection system, types of projections, orthographic projection, principles of orthographic projection. (Only first angle projection method).

*d) Projections of a Point:* Different positions of a point w.r.t. to reference planes, projections of a point when it is placed in first quadrant.

*e) Projections of a Straight Line:* Different positions of a straight line w.r.t. to

reference planes, projections of a straight line when it is inclined to both reference planes *(Case-I and Case-II).*

## UNIT II

a) ***Projections of Planes:*** Definition, types, different positions of a plane w.r.t. to reference planes, projections of a plane when its surface is incline to one R.P. and perpendicular to other R.P. *(Two stages problems).*

b) ***Projections of Solids:*** Definition, classification, different positions of a solid w.r.t. to reference planes, projections of a solid when its axis is incline to one R.P. and

parallel to the other R.P.*(Two stages problems).*

c) ***Section of Solids:*** Definition, types of section planes, types of section views, true shape of section, projections of different solids cut by different section planes. Section of solid when axis of a solid is perpendicular to one R.P. and parallel to the other R.P. (Excluding true shape of section) *(Single stage problems).*

d) ***Development of surfaces of Solids:*** Definition, need, applications, types of development, methods of development, development of surfaces of above cut solids.

**[3Hours]**

## UNIT III

a) ***Orthographic Projection***: Conversion of Pictorial View(3D) into Orthographic (2D) views.

b) ***Isometric View and Projection:*** Definition, isometric and non-isometric lines, isometric planes and axes and isometric scale.

 i) Construction of Isometric View from given orthographic views.

 ii) Construction of Isometric Projection of assembly of two solids with concentric axes.

**[4Hours]**

## UNIT IV

1) ***Introduction to Computer Aided Drawing:***

Definition of CAD, Role of CAD in design and development of new products, advantages and applications of CAD, CAD Softwares.

2) ***Overview of CAD Software:***

a) Demonstrating knowledge of the theory of CAD software such as software screen, layout of the software, standard tool bar, shortcut menu, co-ordinate system and reference planes of 2D/3D environment.

b) Selection of drawing sheet sizes and scale; setting up drawing page and the printer including scale settings, setting up of units and drawing limits; printing of documents using the print command.

c) Basic commands for 2D drawings, applying dimensions to objects and applying annotations to drawings.

d) Creating two dimensional drawings with dimensions using suitable software.

e) Introduction to Solid Modeling: Basic commands for 3D drawings and creating 3D

models of various components using suitable modeling software.

**[4 Hours]**

**Textbooks:**

1) Engineering Drawing - with an Introduction to AutoCAD, Dhananjay A. Jolhe, Tata MacGraw Hills Publishing Company Ltd., 2$^{nd}$ Edition, 2008.
2) Engineering Drawing, N. D. Bhatt, V. M. Panchal and P. R. Ingle, Charotar Publishing House Pvt. Ltd., 53rd Edition, 2014.

3) A Textbook of Engineering Drawing, Dr. R. K. Dhawan, S. Chand and Company Pvt. Ltd., 2015.

**Reference Books:**

1) Engineering Graphics with An Introduction to AutoCAD, A. R. Bapat, Allied Publishers Pvt. Ltd., Revised Edition, 2013.

2) Engineering Graphics-I, Prof. M. L. Dabhade, Vision Publication, 9th Edition.

3) Engineering Graphics, Arunoday Kumar, Tech Mac Publication

| **Course Title: Lab: Computer Aided Graphics** | **Semester: I** |
|---|---|
| **Course Code: 23UFY1A4P** | **Course Category:ESC** |
| **Teaching Scheme: L- T- P** | **Total Credit: 1** |
| 0- 0- 2 | |

| Sheet No. | Title of Sheet | Hours |
|---|---|---|
| 1 | Engineering Curves | 2 |
| 2 | Projections of Straight Lines and Planes | 2 |
| 3 | Projections of Solids | 4 |
| 4 | Section of Solids and development of surfaces of Solids. | 4 |
| 5 | Orthographic Projection | 4 |
| 6 | Isometric View | 4 |
| 7 | Isometric Projection | 4 |
| 8 | Solid Modeling | 6 |
| | Total | 30 |

**Beyond/Additional Syllabus Practicals:**

1) Applications of Straight Lines

2) Missing View using CAD Software

**Reference Books:**

1) Engineering Graphics with AutoCAD, D. M. Kulkarni, A. P. Rustogi and A. K. Sarkar, PHI learning Pvt. Ltd, Revised Edition, 2014.

2) Engineering Graphics with Auto CAD, Dr. H. G. Phakatkar, Nirali Prakashan, 3rd Edition, 2016.

| **Course Title: Lab: Engineering Workshop** | **Semester: I** |
|---|---|
| **Course Code: 23UFY1A5P** | **Course Category: ESC** |
| **Teaching Scheme: L – T – P** | **Total Credits: 1** |
| 0 – 0 – 2 | |

**1. Fitting Shop:** To perform one job in fitting shop

**2. Carpentry Shop:** To perform one job in carpentry shop

**3. Welding Shop and Smithy Shop:** To perform one job in welding shop

**4. Plumbing Shop:** To perform one job in plumbing shop

**Beyond/Additional Syllabus Experiments**

1. Can perform drilling operation on fitting job.

**Reference Books:**
1. Elements of Workshop Technology (Volume - 1): Hajra Choudhury

2. Workshop Technology (Volume - 1): B.S.Raghuwanshi

| | |
|---|---|
| **Course Title: Communication Skills** | **Semester I** |
| **Course Code: 23UFY1A6T** | **Course Category: AEC** |
| **Teaching Scheme: L – T – P – 0** | **Total Credits: 11 – 0** |

**Prerequisites:  Basic knowledge of English language**

**Course Objectives:** Students would be able to enhance their communication skills.

**Course Outcomes**: On completion of the course, students will be able to-
1. Construct grammatically correct sentences
2. Identify and overcome barriers of communication.
3. Demonstrate public speaking and presentation skills.
4. Prepare effective presentations.

COURSE CONTENT:

UNIT I INTEGRATED GRAMMAR

Types of tenses, change the voice, completion of sentences, transformation of sentences (assertive, affirmative, negative, interrogative, exclamatory**)** **[4 Hours]**

UNIT II VERBAL AND NON-VERBAL COMMUNICATIONS

Introduction to Communication, Types of Communication (Verbal and Non-verbal - Kinesics, Vocalics, Chronemics, Haptics, Proxemics), Barriers to communication and methods to overcome them.
**[4 Hours]**

UNIT III SPEAKING SKILLS

Importance of public speaking, Essential steps for public speaking, Do's and Don'ts of Public speaking, Debating Skills. **[3 Hours]**

UNIT IV PRESENTATION SKILLS

Importance of effective presentation, Effective presentation Strategies, Preparation of Power Point Presentation

**[3 Hours]**

**Reference books:**

1. Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP

2. Public Speaking and Influencing Men in Business by Dale Carnegie

3. Professional Communication Skills by Bhatia and Sheikh, S. Chand Publications

4. Communication Skills by Sanjeev Kumar and Pushpalata, OUP

5. Communication Skills by Lalita Bisen, Bhumika Agrawal, N.Thejo Kalyani, Himalaya Publishing House

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**Course Title: Communication Skills**        **Semester I**
**Course Code: 23UFY1A6P**        **Course Category:AEC**
**Teaching Scheme: L – T – P**        **Total Credits: 10 – 0**
         **– 2**

LIST OF EXPERIMENTS:

1. Barriers to Communication

2. Non-verbal Communication

3. Listening Skills

4. Reading Skills

5. Speaking Skills

6. Presentation Skills

7. Group Discussion

8. Interview Techniques

**Beyond/Additional Syllabus Experiments**
1. Development of Word Power

**Suggested Self Readings**

**Suggested Text Books/Reference Books/ Web page (URL)/Research paper, etc.**

1) Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP

2) Public Speaking and Influencing Men in Business by Dale Carnegie

3) Professional Communication Skills by Bhatia and Sheikh, S. Chand Publications

4) Communication Skills by Lalita Bisen, Bhumika Agrawal, N.Thejo Kalyani, Himalaya Publishing House

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**Course Title: Skill Enhancement in Analytical Techniques**      **Semester I**
**Course Code: 23UFY1A7P**        **Course Category:SEC1**
**Teaching Scheme: L – T – P**        **Total Credits: 2**
         **0 – 1 – 2**

**Objective:**

- To promote the possibility of self-employment
- To eliminate the gap between knowledge-based education and market based demands.
- To develop the knowledge of chemistry useful for industries through experimental training
- To improve the attitude of Job responsibility, maintaining Social and environmental awareness.

The Course proposed, aims the engineers with the scope of employability in testing and analysis techniques to establish a linkage with mainstream disciplines, market and Industries. This hands on practical course will provide the sound technical skills to the students in the direction of setting their own start-ups as medium or small scale Industries. This course focuses on training students on how laboratory techniques are carried out in industrial practices.

Proposed Course, which concentrate on experimental practices, includes the basics of characterization, training of standard testing methods and synthesis of technologically important materials, along with handling major and minor equipment and safety measures.

1. Analysis & Gradation of Coal samples found in the region (Moisture, Volatile matter, Fix Carbon & Ash)
2. Testing of lubricating oils used in Automobiles and Machines (Flash Point, Fire Point, Kinematic Viscosities, Acid Values))
3. Testing and analysis of chemical Bath (Electroplating Industries)
4. Testing of Adulteration in Oils (Saponification values)
5. Ore Analysis: Iron, Nickle and Copper ores by approved standard methods.
6. Analysis of water parameters (COD, pH, Alkalinity, Acidity, Conductivity etc. Dissolved Oxygen)
7. Synthesis of important compounds used in Electrical, Computer hardware, Pharmaceutical and other industries.
8. Testing of milk adulteration.
9. Soil Testing for farming and other applications, (pH, Acidity, Nutrients, Moisture)
10. Testing of common Drugs i.e., Paracetamol, Aspirin, Antacids etc.

| | |
|---|---|
| **Course Title- Advanced Calculus and Statistics** | **Semester -II** |
| **Course Code- 23UFY2A1T** | **Course Category: BSC** |
| **Teaching Scheme: L-T-P** | **Total Credits: 3+13 -1-** |
| **0** | |

**Prerequisites:** Basic knowledge of integration, vectors and fundamental of statistics

### Course Objectives:

➢ The objective of this course is to provide solid mathematical foundation to the engineering students.

➢ It aims to impart mathematical thinking to apply its concept in their respective disciplines.

### Course Outcome:

On successful completion of the course, the students will learn:

**CO1:** To analyse length area volume using knowledge of curve tracing.

**CO2:** To solve multiple integral problems and apply it to various engineering problem.

**CO3:** Apply the process of vector differential in real world.

**CO4:** To interpret and analyse the statistical data.

**CO5:** To relate various difference operator for evaluation of difference equation.

**CO6:** To determine various functions of complex numbers.

## COURSE   CONTENT:

### UNIT I: INTEGRAL  CALCULUS

Beta and Gamma functions and their properties. Curve Tracing: Tracing of curves (Cartesian), Applications of definite integrals to find length of the curve, area, volume.

**[6 Hours]**

### UNIT II: MULTIPLE  INTEGRALS

Double integrals (Cartesian and Polar), Change of order of integration in double integrals, Change of variables (Cartesian to Polar). Applications: Area, Mass, Volume and Elementary triple integrals.
**[8 Hours]**

### UNIT III:  VECTOR  CALCULUS

Vector triple product, Product of four vectors, Scalar point function, Vector point function, Vector differentiation, Gradient, Divergence and Curl, Directional derivatives, Solenoidal and Irrotational motions
**[8 Hours]**

### UNIT IV: CORRELATION  AND  REGRESSION

Fitting of a Curve by Method of Least Squares: Straight line $y = a+bx$, Second degree parabola $y = a+bx+cx^2$ and curves of the type $y = ae^{bx}$, $y = ab^x$ and $y = ax^b$, Coefficient of correlation and Lines of regression, Rank correlation.

**[6 Hours]**

### UNIT V: FINITE  DIFFERENCES

Operators E & Delta, Factorial polynomial, Lagrange's interpolation formula for unequal intervals of arguments.                                                                                    **[6 Hours]**

## UNIT VI: COMPLEX NUMBER

Basic concepts of complex numbers and its various forms. Separation of real and imaginary parts, De-Moivre's theorem, Application of De- Moivre's theorem, Exponential function of complex numbers, Circular function of complex numbers, Hyperbolic functions and their inverse, Logarithm of a complex number. (Contemporary Issues related to Topic).                **[8 Hours]**

**Text Books:**

(1) H.K Dass, Rama Verma, Rajnish Verma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Mathematics-I, Mathematics-II, S. Chand.

(2) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(3) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.

(4) Chandrika Prasad, Advanced Mathematics for Engineers.

**Reference Books:**

(1) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

(2) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006. (2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, NewDelhi, 11thReprint, 2010.

(3) M. Spiegel, John Schiller, R.A. Srinivasan, Probability and Statistics(Schaum's Outline Series)

| | |
|---|---|
| **Course Title: Engineering Chemistry** | **Semester II** |
| **Course Code**: **23UFY2A2T** | **Course Category: BSC** |
| **Teaching Scheme: L – T – P** | **Total Credits:3** |
| **3 – 0 – 0** | |

**Prerequisites:** Students are expected to know the fundamental principles of theoretical and experimental chemistry of HSC level.

**Course Objectives:**

1.    To provide engineering students with a solid foundation in the principles and concepts of chemistry, enabling them to understand the chemical processes underlying various engineering applications.

2.    To cultivate the ability of engineering students to apply chemical knowledge to solve real-world engineering challenges.

3.    Students should be prepared to contribute to advancements in engineering through innovativechemical solutions and technologies.

**Course outcomes:** After completion of the course the students will be able to,

**CO1** Apply knowledge of science, mathematics and engineering techniques for assessing the energyof various sources for sustainable uses.

**CO2** Enable the students to upgrade the knowledge of water technologies and to enhance the thinking capabilities in line with the modern trends in engineering        and technology

**CO3** Demonstrate the knowledge of alternative combinations of materials and design improvements to complex engineering problems.

**CO4** Know the contribution to advancemened materials in engineering through innovative chemical solutions and technologies.

**CO5** Apply fundamental theories of molecular structures in analytical tools.

**CO6** Apply the knowledge of green chemistry in providing solution to impact of existing technologies on environment.

## COURSE CONTENTS:

### UNIT I ADVANCEMENT IN ENERGY TECHNOLOGIES

**a)** Introduction to conventional sources of Energy and its classification. Introduction and significance of ultimate analysis of coal. Cracking of heavy oil, Fluid bed Catalytic racking. Use of gasoline and diesel in IC and CI engines. Knocking and chemical constitution of fuel, Octane and Cetane number, doping agents. Combustion Calculations.

**b)** Nonconventional Sources of Energy, and its modern applications, synthetic gasoline by Fischer-Tropsch process. Biodiesel synthesis, advantages and limitations, Syngas, Nuclear fuel and Hydrogen fuel, Blue & Green Hydrogen. **(Current Issues Related to topic)[8 Hours]**

### UNIT II ANALYTICAL ASPECTS OF WATER

Water Treatment for Domestic purpose: Introduction of all steps of Municipal water treatment with emphasis on Coagulation and Sterilization; Breakpoint chlorination, only.

Water Treatment for Industrial purpose: Hardness, Types, Boiler troubles (Scale and Sludge, Boiler Corrosion, Caustic Embrittlement) External Treatment of Boiler feed water through Ion Exchange method: Zeolite process, Numericals & Demineralization.

Treatment of Sea water:RO and Electro dialysis methods. **(Current Issues Related to topic)      [6 Hours]**

### UNIT III ELECTRO CHEMISTRY AND SCIENCE OF CORROSION

Basics of Electrochemistry: Electrode potential, Electrochemical series, Galvanic Series, Galvanic cell, Concentration Cell

Corrosion: Introduction and consequences of corrosion, Chemical, Electrochemical and Differential aeration theories, Numerical on Pilling Bedworth rule. Types of corrosion: Waterline, Pitting, Intergrannular and stress corrosion. Prevention of corrosion through Material selection, design and Cathodic protection, protective Coatings, Tinning & Galvanizing. **(Current Issues Related to topic)                [6 Hours]**

### UNIT IV ADVANCED MATERIALS

Conducting polymers: Synthesis, Properties and Applications of Polypyrrole, Poly acetylene; Biodegradable polymers: Synthesis, Properties and Applications of PLA, Poly Caprolactone; LCP: Phases, General properties and application.

Properties and applications of Nano Quantum Dots & Silicon Chips, Smart materials: Shape Memory alloys,Piezoelectric materials, Chromo active materials and magnetorheological materials. **(Current Issues Related**

**to topic)** [8 Hours]

## UNIT V MOLECULAR STRUCTURE AND ELECTRONIC SPECTROSCOPY

Molecular Structure: Introduction of molecular orbitals on the basis of MOT. Energy level Diagrams of Homo (H to F) and Hetero-nuclear molecules (HF & NO).

Electronic Spectroscopy: Introduction of Electromagnetic Rays, Electronic Vibrations, Absorption and Emission Spectra, Beer-Lambert Rule, Numerical, Electronic Transitions, Fluorescence, Phosphorescence, Jablonski Diagram, Woodword-Fieser rule. **(Current Issues Related to topic)**
**[8 Hours]**

## UNIT VI GREEN CHEMISTRY AND E-WASTE MANAGEMENT

Introduction of Green chemistry ,12 Principles, Carbon Sequestering and Carbon Credit, Green Solvents (Super critical $CO_2$, DMC), Bio enzymes, sustainable Energy Storage Devices-Principal, working advantages and limitations of H2-O2 fuel cell.

E-waste Management: Introduction of E-waste, impact on environment, rules of e-waste generation, management and recycling, Battery e-waste management, modern techniques of e waste recycling. **(Current Issues Related to topic)** **[8 Hours]**

### Suggested Self Readings

**Text Books**
1    A textbook of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition

2    Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co.

3    C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.

4    Applied Chemistry by H.D. Gesser, Springer Publishers

5    Applied Chemistry Das Ganu Prakashan ISBN-978-93-84336-67-7

6    Energy and Environment Das Ganu Prakashan ISBN-978-93-84336-66-0

7     Materials Chemistry S. Chands & Company, ISBN: 81-219-4185-7

8    A text book of Engineering Chemistry, S. Chands & Company: ISBN: 81-219-0539-9

**Course Title: Lab-Engineering Chemistry**  **Semester II**
**Course Code**: 23UFY2A2P  **Course Category: BSC**
**Teaching Scheme: L – T – P**  **Total Credits:1**
　　　　　　　　**0– 0 – 2**

**Outcome: After completion of this course, the students will develop competencies in**
1. Practical knowledge of handling chemical methods in skilled way.
2. Estimation of soluble impurities present in water sample.
3. Strengthening their theoretical knowledge while performing virtual lab experiments.

## LIST OF EXPERIMENTS: (PERFORM MINIMUM 8 EXPERIMENTS)
1. Preparation of different solutions; molar solution, Normal solution, percent solution
2. Determination of Hardness by complexometry of given water sample.
3. Determination of type and extent of alkalinity of water sample.
4. Determination of Dissolved Oxygen in water sample.
5. Determination of capacity of cation exchange resins
6. Determination of free chlorine in given water sample.
7. Proximate Analysis of coal sample.
8. Determination of cell constant and conductance of given solution
9. Virtual Demonstration of UV-Visible Spectrophotometer and FTIR
10. Virtual Demonstration of Lambert-Beer's Law.
11. Synthesis of Urea Formaldehyde Resin.
12. Virtual Demonstration of determination of calorific values of Solid/Liquid.

**Beyond Syllabus Experiments**

1. Preparation of a sample of nanomaterial.
2. Testing and Comparison of water quality parameters of samples collected from different sources of city.
3. Testing of Industrial oil samples.

**Text Books**

1  Experimental Chemistry by S. S. Dara

2  Laboratory manual on Engineering Chemistry, by S. K. Bhasin & Sudha Rani

**Course Title: Computer  Programming Course Code 23UFY2A3T**

**Semester: II**

**Course Category: ESC**

**Teaching Scheme: L – T – P**

  2 – 0 -0

 **Total Credits: 2**

**Prerequisites :** Basics of C Programming Language

**Course Objectives:**

To provide basic understanding of programming.

To enable students to understand features of C programming languages

To develop a different project using C language.

**Course Outcomes:**

After completion of this course, students will able to:

CO1: Defining the Fundamentals for C Programming.

CO2: Explain programming fundamental, including statement and control flow.

CO3: Solve the given problem keeping in mind in Array, function and String approach.

CO4: Analyze Structure and pointer concept during the development solution

## COURSE   CONTENT:

### UNIT I FUNDAMENTALS  OF C PROGRAMMING:

Overview of C: History of 'C', Structure of 'C' program. Keywords, Tokens, Data types, Constants, Literals and Variables, Operators and Expressions: Arithmetic operators, Relational operator, Logical operators, Expressions, Operator: operator precedence and associative, Type casting, Console I/O formatting, Unformatted I/O functions: getch(), getchar, getche(), getc(), putc(), putchar().
**[07 Hours]**

### UNIT II

**Control Constructs:** If-else, conditional operators, switch and break, nested conditional branching

statements, loops: do while, while, for, Nested loops, break and continue, goto and label, exit function.

**Functions:** Definition,  function  components:  Function  arguments,  return  value,  function  call

statement,function prototype, Types of function          **[07 Hours]**

## UNIT III

**Array:** Array declaration, One and Two dimensional numeric and character arrays, Multidimensional arrays.
String: String declaration, initialization, string manipulation with/without using library function.
Structure: Basics, declaring structure and structure variable, typedef statement, array of structure, array within structure, Nested structure; passing structure to function, function returning structure.
  **Union:** Introduction to Union, Difference between Structure and Union, Union of Structures, Utility of Union
**[07 Hours]**

## UNIT IV

Pointer: definition of pointer, pointer declaration, using & and * operators. Void pointer, pointer to pointer, pointer in math expression, pointer arithmetic, file handling: file pointer, file accessing.
**[07 Hours]**


**Suggested Self Readings:**

**Text Books:**

1. Let's us C by Yashavant P Kanetkar.

2. C The Complete Reference By Herbert Schildt

**Reference Books:**

1) C Programming in easy steps, 5th Edition by Mike McGrath
2) C Programming: Language: A Step-by-Step Beginner's Guide to Learn C Programming in 7 Days by Darrel L Graham.

3) C Programming Absolute Beginner's Guide By Greg Perry and Dean Miller


**Course Title: Basics of Electrical & Electronics Engineering**      **Semester: II**
**Course Code**: **23UFY2A4T**                                         **Course Category: ESC**
**Teaching Scheme: L – T – P**                                          **Total Credits: 03**
                      **3 – 0 – 0**


  **Course Objectives:**

  1. To introduce basic ideas and principles of Electrical Engineering

  2. To study construction and operation of electrical devices- transformers, generators and motors.

  3. To acquire knowledge on fundamentals of semiconducting devices and Digital electronics.

  **Course Outcomes:** After the completion of this course, the students shall be able to:

1. Acquire basic concepts of electric and magnetic circuit.

2. Analyze ac series circuits

3. Explain construction, working and applications of single-phase transformers and electric machines.

4.  Discuss 3-phase power generation and basic power system.
5.  Explain operation and applications of semiconducting devices – diode and BJT.

6.  Comprehend with number system and logic gates.

## COURSE CONTENT:

### UNIT I

**Basics of electrical circuits.** Equivalent resistance. Kirchhoff's Laws. Current and Voltage division rule. Electrical Sources, Source Transformation.

Basics of Magnetic circuits and parameters, Right hand grip rule. Magnetomotive Force. Fleming's Left-hand Rule. Reluctance. Magnetic hysteresis and hysteresis loss. Faraday's laws of electromagnetic induction, Lenz's Law. Flemings's Right-hand rule. Comparison of Electric and Magnetic Circuits.
**[6 Hours]**

### UNIT II

Generation of alternating voltage. Values of alternating quantity, Form factor and peak factor. Concept of phasor and its mathematical representation. Concept of phasor diagram. Power in a.c. circuit. Concept of power factor, reactive power and apparent power with power triangle.

Analysis of purely resistive (R), inductive (L), and capacitive (C) circuits. Concept of inductive and capacitive reactance. Analysis of series R – L, R – C, and R – L – C circuits for voltages and current, their waveforms, phasor diagram, impedance triangle, power factor. Series resonance.

**[8 Hours]**

### UNIT III

Transformer: - Introduction, Basic Principles, Construction, Phasor Diagram for Transformer under No Load Condition, Transformer on Load, Basic idea of Losses in transformer, Voltage Regulation and Efficiency. Introduction to Generator and Motors,
Introduction, Working, Construction and applications of - 1) DC Motors 2) Induction Motors (3-phase)

**[8 Hours]**

### UNIT IV

Three phase AC generation, voltage and current relations in star and delta connections. Introduction to Power system- Introduction to Power Generation (Thermal, Hydro, Nuclear and Solar) with block schematic presentation only. Single line diagram for Generation, Transmission & Distribution through different voltage levels.                **[6 Hours]**

### UNIT V

Application of semiconductor diodes: - Rectifier, Clipping and clamping circuits.
Introduction to BJT- NPN and PNP, Modes of operation, Configuration and its Characteristics, BJT as switch and amplifier.                **[8 Hours]**

### UNIT VI

Number systems-binary, binary arithmetic, one's and two's complements arithmetic, decimal, octal and hexadecimal number system. Number system conversion, Basic gates, NAND and NOR operations, Exclusive – OR and Exclusive NOR operations, Examples of IC gates.
**[6 Hours]**

**Text Books|:**

1. D. C. Kulshrehtha, "Basic Electrical Engineering", Tata Mcgraw Hill, 2012.

2. S.K. Bhattacharya , "Basic Electrical and Electronics Engineering", Pearson Education, 2012.

3. Millman Halkias , "Electronic Devices and Circuits", Tata McGraw Hill, 2000

**Reference Books:**

1. Kothari D.P. and Nagrath I.J., "Theory And Problems of Basic Electrical Engineering," Prentice Hall

2. Edward Hughes, "Electrical Technology", Pearson Education , 2008

3. Basic Electrical Engineering A Web course of NPTEL by Day, Bhattacharya & Roy, Available:- www. nptel.ac.in

4. Anand Kumar, "Fundamentals of Digital Circuits", Second Edition, 2009, PHI

5. Malvino, Leach, "Digital Principles and Applications", Sixth Edition, 2006, McGraw Hill.

**Course Title: Lab Basics of Electrical & Electronics Engineering**     **Semester: II**
**Course Code:  23UFY2A4P**     **Course Category: ESC**
**Teaching Scheme: L – T – P**     **Total Credits: 01**
<div align="center">0 – 0 – 2</div>

## LIST OF  EXPERIMENTS:

| | |
|---|---|
| 1 | To verify Kirchoff's laws for electric circuit. |
| 2 | To plot the B-H curve of transformer to study the behaviour of magnetic material |
| 3 | To study behavior of Resistance, Inductor and Capacitor |
| 4 | To study of AC Series circuits. |
| 5 | To determine Voltage regulation and efficiency of a single phase transformer by direct loading. |
| 6 | To Study of BJT as amplifier. |
| 7 | To study basic Gates and verify truth table |
| 8 | To study Universal gates and verify truth table. |
| 9. | To study operation of half wave and full wave rectifier. |
| 10. | To determine performance characteristics of transistor through virtual lab. |
| 11. | To determine performance characteristics of BJT and MOSFET through virtual lab. |

**Innovative Experiments:**
1. Demonstration of cut out sections of transformer and machines.
2. Classify resistance and capacitors.

**Course  Title:  Basics of Mechanical Engineering**     **Semester: II**

| Course Code: 23UFY221T | Course Category: PCC |
|---|---|
| Teaching Scheme: L – T – P | Total Credits:2 |
| 2 – 0 – 0 | |

**Prerequisites:** Students must be aware about the basic knowledge of physics and materials.

**Course Objectives:**

Gain fundamental knowledge of Thermodynamics, Mechanical properties, manufacturing processes and to make aware various production and optimization techniques for decision making.

**Course Outcomes:** After the completion of the course the student will be able to

| CO1 | Enhancement of fundamental knowledge of Thermodynamics |
|---|---|
| CO2 | Enhancement of fundamental knowledge of Mechanical components |
| CO3 | Acquiring knowledge of materials and their properties for engineering. |
| CO4 | Make managerial decisions for effective business administration and Explore various types of work study and evaluate standard time |

## COURSE CONTENT:

### UNIT I INTRODUCTION TO THERMAL ENGINEERING

a. Role of Thermodynamics in Engineering and Science, Laws of Thermodynamics

b. Thermodynamic Systems: Types, terminologies and applications

c. Concept of Heat Engine, Heat Pump & Refrigerator

d. Heat Transfer: Modes of heat transfer, conduction, convection & radiation with examples

e. Hydraulic systems: Introduction to hydraulic turbines & hydraulic pumps.        **(6 Hours)**

### UNIT-II: STUDY OF MECHANICAL COMPONENTS

a) Energy Absorbing and storing elements: Flywheel, Spring and Brakes

b) Power Transmitting Elements: Shafts, Couplings, Clutches & Bearings

c) Mechanical Drives: Belt drive, Chain drive, Rope drive & Gear Drive        **(6 Hours)**

### UNIT-III: MATERIAL SCIENCE & PROCESSING

a. Classification, and applications of various engineering materials.

b. Heat treatment and its importance,

c. Testing of engineering materials

d. Different phases of materials.

e. Metal Casting, Moulding and Patterns,

f. Metal Forming: Extrusion, Forging, Rolling and Drawing,

g. Metal Joining Processes: Gas Welding, Arc Welding, Soldering and Brazing.

h. Machine Tools: Lathe, Milling, Shaper, Planer, Drilling and Grinding        **(8 Hours)**

### UNIT-IV: INTRODUCTION TO INDUSTRIAL ENGINEERING

a. Operation research and its technique, application and limitation of operation research.

**b.** Introduction of assignment model, transportation model, replacement, and sequencing model.Quality Control: Definition and its functions. Quality Planning, Quality audit.

**c.** Work Study, Method Study, Work Measurement and Ergonomics

**d.** Six Sigma, Kaizen, JIT, ISO series                                       (**8 Hours**)

**Textbooks:**

1. Thermal Engineering- Mahesh M. Rathore, McGraw Hill Education

2. A Textbook of Fluid Mechanics and Hydraulic Machines- R. K. Bansal, Laxmi Publications

3. Basic Mechanical Engineering – M.P. Poonia & S.C. Sharma, Khanna Publishing House, Delhi

4. Elements of Mechanical Engineering – M. L. Mathur, F. S. Mehta and R. P. Tiwari, Jain Brothers, New Delhi

5. Operations Research, D. S. Hira and Premkumar Gupta, S Chand Publication, 2018.

**Reference Books:**

1. 1 Engineering Thermodynamics - R.K.Rajput , Laxmi Publication Ltd.

2. Material Science and Metallurgy For Engineers- Dr. V.D Kodgire and S.V Kodgire and B.B Chopane, Everest Publishing House

3. 3 Introduction Technology (Manufacturing Processes)- P C Sharma, S Chand Publications.

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**Course Title: Building Materials and Elements**        **Semester: II**
**Course Code: 23UFY222T**                               **Course Category: PCC**
**Teaching Scheme: L – T – P**                           **Total Credits: 02**
                        **2 – 0 – 0**

**Course Objectives:**

The objective of this course is to make the student to

1. To identify various building materials and their structural requirements

2. To explain the significance of concrete in construction

3. To identify the components of buildings and their functions

4. To discuss the execution of various constructions activities

## COURSE OUTCOMES:

After the completion of the course student should be able to

1. To distinguish different types of building materials and its uses

2. To describe different types of concrete and their properties

3. To recognize necessity of different building components

4. To explain different types of estimates and measurement of building quantities

## COURSE CONTENT:

### UNIT I BUILDING MATERIALS:

**Stones-** Types of stones, requirements of good building stones, uses of stones

**Bricks-** Qualities of good bricks, classification of bricks, terms used in brickwork.

**Cement-** Types of cement, composition of cement, different properties of cement compound, field and laboratory tests for cement

**Timber-** Classification of timber, seasoning of timber, qualities of good timber          **[08 Hours]**

## UNIT II MORTAR

Cement mortar, properties of cement mortar, uses of cement mortar

Concrete: types of concrete, major ingredients of concrete, formation of cement concrete, properties of fresh and hardened concrete.          **[06 Hours]**

## UNIT III BUILDING ELEMENTS

Necessity and types of foundations, types of structure based on method of load transfer, types of stone masonry, types of bonds in brickwork, Necessity of plastering and pointing, types of beams, columns and lintels, Terminologies in doors and windows and their types, terminologies in staircase and classification, Types of roofs and floorings.          **[08 Hours]**

## UNIT IV

Introduction to estimation, necessity of estimation, units and measurements, Types of estimates, methods of estimation, Methods of taking out quantities Building layout, setting out foundation trenches.

**[06 Hours]**

**Text Books**

1. Building Construction by Rangwala Charotar Pub. House
2. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
4. Building Materials and Construction by G. C. Sahu, Joygopal Jena McGraw hillPvt Ltd.

**Reference Books**

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
4. Alternate Building Materials and Technology by Jagadish, Venkatarama Reddy and others; New Age Publications
5. Estimating & Costing in Civil Engineering by B.N. Dutta, UBS Publishers Distributors Limited

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|---|---|
| **Course Title: Renewable Energy Sources** | **Semester: II** |
| **Course Code**: 23UFY223T | **Course Category: PCC** |
| **Teaching Scheme: L – T – P** | **Total Credits:02** |
| **2 – 0 – 0** | |

**Course Objectives:**
1. To understand the principles of generating Electrical energy from Renewable Energy Sources.
2. To overcome the effects on environment with the use of renewable energy source.

## COURSE OUTCOMES:

After the completion of this course, the students shall be able to:

1. Classify types of renewable energy sources and different factors associated with a generating station

2. Explain various parameters related to selection and application of Solar and Wind Energy.

3. Describe various parameters for Hydro, Ocean and wave energy.

4. Discuss environmental issues related to use of conventional energy sources.

## COURSE CONTENT:

### UNIT I GLOBAL AND NATIONAL ENERGY SCENARIO

Overview of conventional & renewable energy sources, need, potential & development of renewable energy sources, Future of Energy Use, Global and Indian Energy scenario, Energy for sustainable development, Potential of renewable energy sources, Classification of energy resources, Renewable-Nonrenewable, Green energy, clean energy (Definitions and examples). **[7 Hours]**

### UNIT II SOLAR & WIND ENERGY

Solar Energy: Solar energy system, Solar Radiation, Availability, Solar Thermal Conversion Devices and Storage, general Solar Photo Voltaic (SVP) system, Module, panel and array, Applications of Solar Energy.

Wind Energy: Wind Energy Conversion, Nature of the wind, Site selection, Wind farms, wind energy potential and installation in India, Advantages and limitations of Wind Energy**. [8 Hours]**

### UNIT III HYDRO, TIDAL & OCEAN ENERGY

Hydro Energy- Basic working principle, Classification of hydel systems: Large, small, micro systems, Advantages and Disadvantages.

Tidal Energy- Introduction, Basic Principles of Tidal Power, Site Selection, Storage, Advantages and Disadvantages.

Ocean Energy- OTEC, Principles utilization, introduction to Wave Energy Based Power Plants, Advantages and Disadvantages. **[8 Hours]**

### UNIT IV ENVIRONMENTAL ASPECTS OF ENERGY SOURCES

Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, Global climate change, $CO_2$ reduction potential of renewable energy biological damage due to environmental degradation. Environmental effects of thermal power station, nuclear power generation, hydroelectric power, Ocean energy harvesting, Wind energy harvesting, Solar energy harvesting.
**[7 Hours]**

### Suggested Self Readings

#### Text Books

1  1 M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A Textbook on Power System Engineering, 2nd edition 2014, Dhanpat Rai and Co.

2  V.K.Mehta, Rohit Mehta, Principles of Power System, 2nd edition 2008,S.Chand

3  B.R.Gupta, Generation of Electrical Energy,5th edition 2007, S.Chand

4  G. D. Rai, Non-Conventional Energy Sources, 5th edition 2011, Khanna Publication

5  B.H. Khan Non-conventional energy source, 2nd edition,TMH

**Course Title: Introduction to Aeronautical Engineering**     **Semester: II**
**Course Code: 23UFY224T**                                     **Course Category: PCC**
**Teaching Scheme: L- T- P**                                   **Total Credits: 022 – 0**
                        **– 0**

**Course Objectives:**

To acquaint the students with the fundamentals of Aeronautical Engineering and to build their perspective in a wholesome manner.

## COURSE OUTCOMES:

Upon successful completion of the course, student should be able to:

**CO1**. Recognize the basics of aircraft developments and aviation industry.

**CO2**. Quote basic aerodynamic aspects.
**CO3**. Memorize various aircraft components and material requirements.

**CO4**. Enumerate the overview of aircraft propulsion and performance basics.

## COURSE CONTENT:

### UNIT I ELEMENTS OF AERONAUTICS

Historical development of aeronautical engineering, Introduction to Role and functions of various aviation organizations (DGCA, FAA, ICAO etc.), Introduction of commercial aircraft, military aircrafts and UAV's, Career opportunities as aeronautical engineer.                                         **[6Hours]**

### UNIT II BASIC AERODYNAMICS

Basics of fluid mechanics and aerodynamics, Forces governing aircraft flight: Lift, drag, thrust, and weight, Angle of attack, stall, Aircraft stability, control surfaces, and flight maneuvers. **[6Hours]**

### UNIT III AIRCRAFT STRUCTURE

Introduction to aircraft materials: metals, composites and their properties, Structural components of an aircraft: fuselage, wings, empennage, landing gear. Loads, Stress and strain for aircraft structures. Spacecraft components.                                         **[8 Hours]**

Types of Jet engine and rocket, Basic parameters: Thrust power and fuel consumption, Basic aircraft performance parameters, Factors influencing aircraft performance: altitude, temperature, and weight.
**[6 Hours]**

**Suggested Self Readings**

      **Textbooks**

1    Lalit Gupta & Dr. O.P. Sharma, "Fundamentals of Flight (Vol. 1- Vol.4)". Published by Himalayan Books.

      **Reference Books**

1    John Anderson Jr., "**Introduction to Flight (SI Units)"** McGraw Hill Education.

2    Kermode, "**Flight Without Formulae**" Pearson India.

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| **Course Title: Indian Traditional Knowledge** | **Semester: II** |
| **Course Code: 23UFY2A5T** | **Course Category: IKS** |
| **Teaching Scheme: L – T – P** | **Total Credits: 2** |
|           **2 – 0 – 0** | |

**Prerequisites:  Basic knowledge of Indian culture, tradition, art and science**

**Course Objectives:** Students would be able to acquire basic understanding of rich heritage of Indian Knowledge System .

**Course Outcomes**: On completion of the course, students will be able to-

1. Interpret basics of Indian Knowledge system.

2. Integrate the teaching of Indian culture and civilization.
3. Appreciate Indian artistic tradition.

4. Analyze Indian architectural system.

## COURSE   CONTENT:

### UNIT I INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM

Introduction & overview of Indian Knowledge system, The Vedic Corpus -Vedas, Types of Vedas, Upavedas, Types of Upavedas          **[8 Hours]**

### UNIT II INDIAN CULTURE AND CIVILIZATION

 Indian culture and its characteristics, Indus valley civilization, Vedic civilization.    **[6 Hours]**

### UNIT III INDIAN ARTISTIC TRADITION

Indian Artistic tradition, Chitrakala- Indian style painting, Sangeet- Carnatic music & Hindustani music, Nritya : Indian dance forms                                    **[8 Hours]**

## UNIT IV INDIAN ARCHITECTURE AND TOWN PLANNING

The Importance of Sathapatya-veda, The ancient cities of the Indian Saraswati region - Harappa and Mohenjodaro civilization, Town planning and drainage system            [**6 Hours**]

**Suggested Self Readings**

   **Text Books**

1   Introduction to Indian Knowledge System by Mahadevan, B, Bhat, Vinayak Rajat, Nagendra Pavana R.N., Prentice Hall India Pvt., Limited, 2022.
2   Indian knowledge Systems, Kapil Kapoor, Avadhesh Kumar Singh, D.K, Printworld.
3   Traditional Knowledge System in India by Amit Jha, Atlantic Publishers, 2002
4   1. Indian Art & Culture (E), By Anurag Kumar, Arihant Publication India Limited, 2016
5   Indian Architecture by Percy Brown, D. B. Taraporevala sons & co. Pvt. Ltd., Bombay, 1959.
6   https://prepp.in/news/e-492-indian-architecture-art-and-culture-notes

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**Course Title: Skill Enhancement in Instrumental Techniques**     **Semester: II**
**Course Code: 23UFY2A7P**                                          **Course Category:SEC2**
**Teaching Scheme: L – T – P**                                      **Total Credits: 20 – 1–**
                              **2**

**OBJECTIVES:** Vocational courses aims to:

1.  Incorporate vocational education with mainstream education where students can study vocational courses along with their regular academic courses.

2. Combine theoretical knowledge with development of practical skills, to make student job ready and be ready to face life challenges.

3. Assist the students in selecting, preparing and acquire training for, entering and making rapid progress in the career or occupation of their choice.

4. It intends to provide students with opportunities to acquire various skills to meet the needs of the industries and to improve the quality of education.

**COURSE OUTCOMES:** Students will be able -

1] To strengthen the skill by hands-on experimentation using concepts and ideas in Physics to explain world around us.

2] To execute Experimental Physics which has the most striking impact on the industry and research because of its vast applications.

3] To craft Physics goals for students that boost natural curiosity for ease in real life.

**LIST OF EXPERIMENTS:**

1. Testing of smoothness of Fiber/glass/lenses surfaces used in optical industry to ensure high quality as any imperfections or in distortion, aberrations and reduced optical performance.

2. Basic study of crystal structure using models of Bravais lattices (applicable for study of material) to determine the properties of a material by Crystal structure using models of Bravais lattices.

3. Testing of various circuit components using C.R.O. in industries for various purposes, including electronic testing, troubleshooting, waveform analysis, and signal visualization, enabling engineers and technicians to diagnose and monitor electrical signals and circuits with precision and accuracy.

4. Determination of thickness of thin films for the application of Anti-Reflection Coating in industries, such as optics, eyewear, camera lenses, and solar panels, to minimize light reflections, increase light transmission, and improve overall optical performance and efficiency of the products.

5. Hands on training of Soldering and Desoldering techniques in Electronics and other industries.

6. Practical use of Vernier Calliper and Screw Gauge for precise measurements of length, diameter, and thickness, ensuring accurate manufacturing processes and quality control.

7. Testing of magnetic properties of material using B-H curve in industries for designing and optimizing magnetic components and devices, such as transformers, inductors, and motors, to ensure efficient energy transfer and performance.

8. Determination of electrical conductivity using Hall effect in industries for various applications, such as non-contact sensing, flow measurement, and current measurement in electronic devices, enabling precise monitoring and control of processes and equipment.

9. Application of Optical Fiber in Photonic communication to transmit data as light pulses over long distances with minimal signal loss, enabling high-speed and reliable communication in telecommunications networks.

10. Inverse square law using Photovoltaic cell in industries that use photovoltaic cells to understand the relationship between solar irradiance and distance, ensuring proper placement and orientation of solar panels for maximum energy absorption and efficiency, which is the need of an era so as to save(water) and use(sunlight) the natural resources.

11. Find resolving power and dispersive power of plane diffraction grating in industries, such as spectroscopy, telecommunications, and laser technologies, where they are used to disperse and analyse light spectra, control light wavelengths, and improve optical signal processing.

12. Study of characteristics of photo- diode in industries for light detection and sensing applications, such as in optical communication, automotive sensors, barcode scanners, and medical devices, due to their fast response, high sensitivity, and low power consumption.

13. To determine the thickness of mica sheets used in aerospace, cosmetics, marine and other industries by biprism.

14. Study of newton's law of cooling, specific heat of kerosene oil in Chemical industries for optimizing heat transfer processes, such as cooling systems and thermal management, ensuring efficient and cost-effective operations.

15. Use of Ultrasonic distance meter to measure the distance between the sensor and an object without physical contact in various industries by sending and receiving ultrasonic waves, finding applications in construction, manufacturing, and automation for accurate and non-contact distance measurements.

16. Determination of wavelength of light using Laser diffraction method in industries, including particle size analysis of powders and suspensions, characterization of aerosols, and monitoring of crystallization processes, enabling efficient quality control, formulation, and research in pharmaceuticals, food and beverages, mining, and materials manufacturing industries.