PRIYADARSHINI COLLEGE OF ENGINEERING
(Recognised by A.I.C.T.E. New Delhi & Govt. of Maharashtra Affiliated to R.T.M. Nagpur University)
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AICTE ID No. 5435581; DTE CODE No. 4123; UNIVERSITY CODE No. 278
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AN AUTONOMOUS INSTITUTE

FIRST YEAR ENGINEERING

CURRICULUM

UNDER GRADUATE PROGRAMME

B.Tech First Year

(Chemical Engineering/ Biotechnology)

WITH EFFECT FROM THE ACADEMIC YEAR 2023-2024.

SCHEME OF EXAMINATION w.e.f. 2023-24 onwards

FIRST SEMESTER B. TECH. (CHEMICAL ENGINEERING/ BIOTECHNOLOGY)

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	**23UFY1A1T**	**BSC**	**ASH**	Basic Calculus & Differential Equations	3	0	0	3	40	60	--	--	100
2	**23UFY1C2T**	**BSC**	**ASH**	Applied Physics	2	0	0	2	20	30	--	--	50
3	**23UFY1C2P**	**BSC**	**ASH**	**Lab:** Applied 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 Aided Graphics	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:** Communication Skills	0	0	2	1	--	--	25	25	50
11	**23UFY1A7P**	**SEC1**	**ASH**	Skill Enhancement in Analytical Techniques	0	1	2	2	--	--	25	25	50
12	**23UFY1C8T**	**BSC**	**ASH**	Applied Chemistry	2	0	0	2	20	30	--	--	50
13	**23UFY1C8P**	**BSC**	**ASH**	**Lab:** Applied Chemistry	0	0	2	1	--	--	25	25	50
14	**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 Learning Course: NSS-1									
					12	**1**	**14**	**22**	**160**	**240**	**225**	**175**	**800**

SECOND SEMESTER B. TECH. (CHEMICAL ENGINEERING/ BIOTECHNOLOGY)

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	**23UFY2C1T**	**BSC**	**ASH**	Advanced Calculus Fourier Series & Statistics	3	1	0	4	40	60	--	--	100
2	**23UFY2C2T**	**BSC**	**ASH**	Material Science	2	0	0	2	20	30	--	--	50
3	**23UFY2C2P**	**BSC**	**ASH**	**Lab** : Material Science	0	0	2	1	--	--	25	25	50
4	**23UFY2C3T**	**BSC**	**ASH**	Applied Physical Chemistry	2	0	0	2	20	30	--	--	50
5	**23UFY2C3P**	**BSC**	**ASH**	**Lab**: Applied Physical Chemistry	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	**23UFY228T**	**PCC**	**CHE**	Introduction to ChemicalEngineering	2	0	0	2	20	30	--	--	50
	23UFY229T		**BIO**	Fundamentals in Life Sciences									
9	**23UFY2A5T**	**IKS**	**ASH**	Indian Traditional Knowledge	2	0	0	2	20	30	--	--	50
10	**23UFY2A7P**	**SEC2**	**ASH**	Skill Enhancement 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									
					14	**2**	**08**	**22**	**160**	**240**	**150**	**100**	**650**

Principal
Priyadarshini College of Engineering, Nagpur

DEAN ACADEMICS
PRIYADARSHINI COLLEGE OF ENGG
NAGPUR

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: Applied Physics | **Semester I**
Course Code: 23UFY1C2T | **Course Category: BSC**
Teaching Scheme: L – T – P | **Total Credits: 2**
2 – 0 – 0

Prerequisites: Students should have basic knowledge of optics and laws of fluid mechanics

Course Objectives:

1. To explore the fundamentals of fluid properties alongwith their related applications.
2. To introduce optical phenomena and their applications.
3. To provide a strong foundation in mathematical derivation and numerical problems.

Course Outcomes: Students will be able to

CO1. Develop the basic concepts of viscosity and its technological applications.

CO2. Develop the basic concepts of surface tension and its applications to technology.

CO3. Describe quantum transitions and apply it to the working of lasers.

CO4. Apply concepts of interference and diffraction and its relevant engineering applications.

COURSE CONTENT:

UNIT I SURFACE TENSION & VISCOSITY

Surface tension, Excess pressure inside a liquid drop and soap bubble, Angle of contact, Searl's Torsion Balance method, Quincke's method, Interfacial surface Tension.
Streamline flow, turbulent motion, critical velocity, Viscosity, Coefficient of viscosity, Significance of Reynolds number, Stokes's method, Ostwald viscometer. **[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 Ψ 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.
Quantum Computing: Operators, Eigen value and Eigen Function, Bra and Ket notations, Bits and Qubits.
[8 Hours]

UNIT III: 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 IV: 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.
[8 Hours]

Textbooks:

1. A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication.
2. Elements of Properties of Matter, D.S. Mathur, S. Chand Publication.

Reference Books:

1. Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).
2. A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).
3. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R.Resnick, Wiley and Sons.
5. Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt.Ltd.(2016).
6. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, JohnWiley and Sons, (2017).
7. Quantumn Mechanics, Theory and Applications, 3rd Edition, A.K. Ghatak and S. Lokanathan, Macmillan India Ltd. (1984).
8. Quantumn computing for Computer Scientists, N. S. Yanofsky and M. A. Mannucci., Cambridge University Press. (2008).

Course Title: Applied Physics **Semester I**

Course Code: 23UFY1C2P **Course Category: BSC**
Teaching Scheme: L – T – P **Total Credits: 1**
0 – 0 – 2

Course Outcomes: Students will be able to

CO1: know and measure the surface tension of liquid using various methods.

CO2: know and determine the coefficient of viscosity using different methods.

CO3: know the phenomenon of wave nature of light like interference and diffraction and its applications.

LIST OF EXPERIMENTS: (PERFORM MINIMUM 8 EXPERIMENTS)

1. To determine the surface tension of liquid using Searl's Torsion Balance method.

2. To determine the surface tension of liquid using Jaeger's method.

3. To determine the surface tension of liquid using Quincke's method.

4. To determine the Interfacial surface tension between the two immiscible liquids.

5. To determine the coefficient of viscosity of liquid using Stoke's method.

6. Study of Ostwald's viscometer.

7. To determine the coefficient of viscosity of liquid using Poiseulle's method.

8. To determine the radius of curvature of a plano-convex lens using Newton's rings method.

9. Interference in thin films: Study of wedge shaped thin film.

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

11. 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.

Course Title: Engineering Mechanics **Semester I**
Course Code: 23UFY1A3T **Course Category: ESC**
Teaching Scheme: L – T – P **Total Credits: 3**
3 – 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. **[06 Hours]**

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: 1**
0 – 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 technicaldrawings 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).*

[3Hours]

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).*

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 3Dmodels 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., 2nd 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

LIST OF PRACTICALS:

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: Engg. Workshop **Semester: I**
Course Code: 23UFY1A5P **Course Category: ESC**
Teaching Scheme: L – T – P **Total Credits: 1**
0 – 0 – 2

LIST OF EXPERIMENTS:

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 | **Total Credits: 1**
1 – 0 – 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: 1**

0 – 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

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: Applied Chemistry **Semester - I**
Course Code: 23UFY1C8T **Course Category: BSC**
Teaching Scheme: L – T – P **Total Credits: 022 – 0 –**
0

Prerequisites: HSC Chemistry

Course Objectives:

1) To acquaint the students with the basic concepts of Chemistry and their applications in theEngineering field.

2) Applying knowledge of water treatment from an engineering viewpoint.
3) To develop understanding of chromatographic & spectroscopic techniques.
4) To provide an insight into Green Chemistry and its applications in engineering fields.

COURSE OUTCOMES:

After learning the course, the students will be able:

CO 1: To demonstrate the knowledge of water treatment processes in industries.

CO 2: To explain the principles & techniques of chromatographic techniques.

CO 3: To demonstrate the knowledge of spectroscopic techniques in identification of compounds.

CO 4: To demonstrate the knowledge of green chemistry in industries.

COURSE CONTENTS:

UNIT I WATER

Types of impurities and their effects, hardness of water. Treatment of water for domestic & industrial purposes: sedimentation, coagulation, filtration, Sterilization- chlorination, break point chlorination, Ozonisation. Removal of hardness of water: Zeolite process, its advantages and disadvantages, Numerical based on zeolite process, demineralization process. Boiler troubles: -Carry over- priming & foaming-causes & prevention, sludge & scales, causes of scale formation and prevention methods, Corrosion & caustic embrittlement causes & prevention. Desalination of water by Reverse Osmosis & electrodialysis. **[08Hours]**

UNIT II BASICS OF CHROMATOGRAPHIC TECHNIQUES

Introduction, Classification, General and fundamental concepts of TLC, Column, HPLC, GC, Ion Exchange and their applications. **[06 Hours]**

UNIT III BASICS OF SPECTROSCOPIC TECHNIQUES

Electronic spectroscopy- basic principles, Lambert-Beer's law, Woodward Fisher Rule for conjugated dienes, Numerical on Lambert-Beer's Law, Numerical on Woodward Fischer Rule, Fluorescence, Phosphorescence, Jablonski Diagram and its applications **[06 Hours]**

UNIT IV BASIC GREEN CHEMISTRY

Green Chemistry: - Introduction, twelve principles of Green chemistry with examples, Numerical based on atom economy, Carbon sequestration & Carbon Credits, Supercritical CO2 properties and applications, Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics. **[08 Hours]**

Suggested Self Readings

Textbooks

1 A Text Book of Engineering Chemistry, by S.S.Dara, S.Chand & Co., New Delhi.
2 A Text Book of Engineering Chemistry, by Jain & Jain, Dhanpat Rai Publishing Co., New Delhi.
3 Industrial Chemistry by B.K.Sharma Goel Pub. House, Meerut.
4 Text of Engineering Chemistry by Dr. Sunita Rattan, S. K. Kataria and Sons, New Delhi.
5 Analytical Chromatography by Dr. G. R. Chatwal, Himalaya Publication House.
6 An Introduction to Green Chemistry by V. Kumar, Vishal publishing Co. Reprint Edition 2010
7 Green Chemistry by Rashmi Sanghi, M.M Srivastava Fourth Reprint - 2009
8 Green Chemistry: Theory & Practice, Anastas & Warner, Oxford Univ. Press, New York,1998

Course Title: Lab- Applied Chemistry **Semester I**
Course Code : **23UFY1C8P** **Course Category: BSC**
Teaching Scheme: L – T – P **Total Credits: 01**

0 – 0 – 2

Course Outcomes: After learning the course, students will be able:

CO1: To apply the principles studied in theory in practical and gain hands-on experience of analysis, observations and data interpretation.
CO2: To develop skills in procedures relevant to quality control and analysis tasks in industry.
CO3: To know and follow the proper procedures and regulations for safe handling and use of chemicals.
CO4: To communicate the concepts and results of their laboratory experiments through effective writing and oral communication skills.

LIST OF EXPERIMENTS: (PERFORM MINIMUM 8 EXPERIMENTS)

1. Estimation of Total Hardness by Complexometric Method in a given Sample of water.
2. Estimation of Calcium and Magnesium hardness in a given sample of water.
3. Estimation of Nickel by Complexometric Method in a given Sample of water.
4. Estimation of total alkalinity in the given water sample.
5. Estimation of percentage of Copper in the given solution of copper sulphate by Iodometry Method.
6. Estimation of Strength of Potassium Dichromate using Sodium Thiosulphate by Iodometry Method.
7. Determination of strength of Ferrous Ammonium Sulphate using Potassium Dichromate and SDS as an internal indicator.
8. Estimation of strength of NaOH using oxalic acid.
9. Estimation of strength of HCl using Borax.
10. To determine the number of components in a mixture using TLC.

11. To determine the number of components in a mixture using Column chromatography.
12. To determine the ion exchange capacity of an ion exchanger.
13. Beer-Lambert's law verification and determination of strength of unknown solution using spectrophotometer.

Beyond Syllabus Experiment:

1. To determine dissolved oxygen in a given sample of water.

Suggested Self Readings

Text Books

1 A textbook on Experiments and Calculations in Engineering Chemistry (ninth edition), S.S Dara, S. Chand, 2003.
2 Laboratory Manual on Engineering Chemistry, S. Rani, Dhanpat Rai Publisher, 1998.

Course Title-Advanced Calculus, Fourier Series & Statistics **Semester -II**
Course Code- 23UFY2C1T **Course Category : BSC**
Teaching Scheme: L-T-P **Total Credits: 3+1**
3 -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 demonstrate various applications using vector integral theorem.

CO5: To apply concept of fourier series for learning advance engineering mathematics.
CO6: To interpret and analyse the statistical data.

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. **[8 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 - I

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
[6 Hours]

UNIT IV: VECTOR CALCULUS II

Line integrals and Work done, Line, surface and volume integrals, Statement of Stoke's theorem, Gauss divergence theorem and Green's theorem (without proof), Simple applications of these theorems
[6 Hours]

UNIT V: FOURIER SERIES

Fourier series, expansion of a function, Even and odd function, Half range fourier series, change of interval, Harmonic analysis **[6 Hours]**

UNIT VI: STATISTICS

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. **[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: Material Science | **Semester II**
Course Code:23UFY2C2T | **Course Category: BSC**
Teaching Scheme: L – T – P | **Total Credits: 2**
2 – 0 – 0

Prerequisites: Students should have basic knowledge of solid state physics.

Course Objectives:

4. To introduce the basics and applications of Advanced Engineering Materials.
5. To provide a strong foundation in mathematical derivation and numerical problems.

Course Outcomes:

Students will be able to

CO1.Apply concepts of Crystal Structure and X-rays for determining characteristics of the materials.
CO2. Study of semiconductor devices along with their applications.
CO3. Learn the concepts of magnetism and superconductivity, classify and analyze various types of magnetic and superconducting materials.
CO4. Learn the concepts and types of nanomaterials, compare its properties with those of bulk materials

COURSE CONTENT:

UNIT I: CRYSTAL STRUCTURE AND X-RAYS

Crystal structure, meaning of lattice and basis, Unit cell: primitive and non-primitive unit cell; Cubic crystal structure: Simple, Body and Face centered cubic structures, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, nearest neighbor distance, coordination number, atomic packing fraction, void space, density.

Crystal planes and Miller indices, Inter-planar distance and its co-relation with Miller indices and lattice parameter, Production of X-rays, Coolidge tube, Origin of X-rays, Properties and applications of X-rays, Bragg's law of X-ray diffraction. **[8 Hours]**

UNIT II: SEMICONDUCTOR DEVICES

Types of Semiconductor diodes, P-N junction Diode: Characteristics of P-N junction Diode, Tunnel Diode, Zener Diode, LED, Photodiode.
Transistors. Hall effect, Hall voltage and Hall coefficient; its applications. **[6 Hours]**

UNIT III: MAGNETIC AND SUPERCONDUCTING MATERIAL

Classification, Characteristics and applications of Diamagnetic, Paramagnetic, Ferromagnetic, Ferri-magnetic and anti-ferromagnetic materials, Explanation on the basis of domain. Hysteresis curve.

Superconductors: Basics of superconductivity: Zero electrical resistance, Persistent current, Effect of Temperature, Effect of Magnetic Field, Critical Current; The Meissner Effect. Type-I and type-II superconductors, London Equation: The penetration depth, Bardeen-Cooper-Schrieffer (BCS) theory **[8 Hours]**

UNIT IV: NANOMATERIALS

Introduction to Nanoscience, Classification of nano materials, Types of Synthesis of Nanomaterials,
Comparison of properties of nanomaterials with bulk materials,
Some special nanomaterials: 1) Zeolites, 2) Graphene, Application of nanomaterials in engineering.

[6 Hours]

Textbooks:

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

2.Elements of Properties of Matter, D.S. Mathur, S. Chand Publication.

Reference Books:

1. Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).
2. A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).
3. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R.Resnick, Wiley and Sons.
4.Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt.Ltd.(2016).
5. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, JohnWiley and Sons (2017).

Course Title: Lab-Material Science | **Semester II**
Course Code: 23UFY2C2P | **Course Category: BSC**
Teaching Scheme: L – T – P | **Total Credits: 2**
2 – 0 – 0

Course Outcomes: Students will be able to

CO1: know and analyze characteristics and applications of semiconductor devices like diodes and transistors.

CO2: know and measure the energy band gap of a semiconductor material.

CO3: study unit cell characteristics.

LIST OF EXPERIMENTS: (PERFORM MINIMUM 8 EXPERIMENTS)

1. To study the characteristics of a PN-junction diode in forward and reverse bias & determine its cut in voltage, static & dynamic resistance.
2. To study the characteristics of a Zener diode in forward and reverse bias & determine its breakdown voltage.
3. To determine the Energy gap Eg of semiconductor using PN junction diode in reverse biasmode.
4. To study the V-I characteristics of a Light Emitting Diode.
5. To study the V-I characteristics of a Photo Diode.
6. To study PN junction diode as Half wave and Full wave rectifier and calculate ripple factor and efficiency in each case.
7. To study the input and output characteristics of a transistor in Common base mode & calculate input resistance and current gain α.
8. To study the input and output characteristics of a transistor in Common emitter mode & calculate input resistance and current gain β.
9. Comparison of characteristics of SC, BCC and FCC unit cells.

10. Virtual lab experiments.

Innovative Experiments

1. To measure experimental value of Plank's constant on the basis of Plank's quantum hypothesis using LED.
2. To measure the unknown frequency using CRO.

Textbooks:

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

2. Elements of Properties of Matter, D.S. Mathur, S. Chand Publication.

Reference Books:

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

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

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

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

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

Course Title: Applied Physical Chemistry **Semester II**
Course Code: 23UFY2C3T **Course Category: BSC**
Teaching Scheme: L – T – P **Total Credits: 02**
2 – 0 – 0

Prerequisites: Basic Knowledge of Mathematics and Chemistry

Course Objectives:

1) To acquaint the students with the basic concepts of Chemistry, and their applications in the Engineering field.
2) To enable the student to upgrade the existing knowledge of chemical equilibrium and its application in daily life, environmental and industrial fields.
3) To impart basic knowledge related to atoms, molecules, spectroscopy and quantum computer on basis of Quantum mechanics
4) To provide an insight into Surfactants and emulsions and its applications in engineering fields.

COURSE OUTCOMES: AFTER THE COMPLETION OF THE COURSE, STUDENT SHOULD BE ABLE TO

CO1	Implement the thermodynamic properties of gaseous phase and equilibrium conditions for chemical reactions.
CO2	Develop the concept of electronic structure, molecular dynamics and quantum computers using the Schrödinger equations.
CO3	Sketch the phase diagram for various solid systems and judge their metallurgical applications. Sketch the phase diagram for various solid systems and judge their metallurgical applications.
CO4	Recognize the stability and importance of disperse systems

COURSE CONTENT:

UNIT I THERMOCHEMISTRY & CHEMICAL EQUILIBRIUM

A] **Thermochemistry:** General terminology, Kirchoff's Equation, standard enthalpy of reaction, standard enthalpy of formation, enthalpy change during phase transitions, Standard enthalpy of combustion ($\Delta H_C°$), Bond enthalpy, enthalpy of solution, Determination of change in internal energy & Heat capacity-Calorimetry, Bomb Calorimetry, Hess's Law, Numerical on standard enthalpy, Hess's Law, & Calorimetry.

B] **Chemical equilibrium:** Partial Molar quantities, Chemical Potential, Chemical equilibria of homogeneous & heterogenous systems, derivation of expression of equilibrium constants, Relation between Kp, Kc and Kx, Le Chatelier's principle of dynamic equilibrium. Effect of change of concentration, pressure, temperature and catalyst on equilibrium constant, Numerical on chemical & biological systems.

[8 Hours]

UNIT II QUANTUM MECHANICS

A] Uncertainty principle, Numerical on uncertainty principle, Introduction of quantum mechanics, Postulates of quantum mechanics, wave function, normalized and orthogonal wave function, Schrodinger wave equation.

B] Application of schrodinger wave equation to simple systems: particle in a one-dimensional box: derivation of energy and normalization and orthogonality of wave function. Graphical representation of ψ and its square ψ2. Orbital & orbit, application of schrodinger equation for conjugated molecules, and nanoparticles. (quantum wells, quantum wires and quantum dots). Quantum computers**.**

[6 Hours]

UNIT III

A] Phase Equilibria: Clausius-Clapeyron equation; Concept of phases, components and degrees of freedom; derivation of Gibbs Phase Rule; Phase diagram for one component systems: water, CO_2 and sulphur. Two component Eutectic system: Pb- Ag system, Eutectic system with congruent and incongruent melting point.

B] Liquid-liquid Separation: Nernst distribution law and its Applications, Solvent Extraction, Numerical. **[8 Hours]**

UNIT IV SURFACTANTS

Types, adsorption at surfaces and interfaces, surfactant aggregates, factors affecting aggregation phenomena, applications of surfactants and mixed surfactant systems. Disperse systems - Emulsions microemulsions and foams -. Thermodynamics and stability, HLB values, colloids - preparation, stability, characterization, surface charges and electrical double layer.

[6 Hours]

Suggested Self Readings

Text Books

1 C.N. R. Rao, University General Chemistry. Mc. Millan Publication.

2 Chandra, A. K. Introductory Quantum Chemistry Tata McGraw-Hill (2001).

3 Puri sharma & Pathania, Principles of Physical Chemistry, Paperback

4 Introductory Physical Chemistry I David Ronis © 2014 McGill University

5 Instrumental Methods of Analysis by H. H. Willard, L. L. Merritt, J. A. Dean and F. A. Settle, Wadsworth Publishing, USA

6 I.N. Levine, Quantum Chemistry, 5th edition (2000), Pearson Educ., Inc. New Delhi

7 Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry 8 th Ed., Oxford University Press

8 Surfactants and interfacial phenomena- Milton J Rosen – Wiley Interscience 4

9 Industrial utilization of surfactants principles and applications – M.J. Rosen and M Dahanayake,

10 Foundations of Colloid science – Robert J Hunter – Oxford university Pres

Course Title: Lab-Applied Physical Chemistry **Semester II**
Course Code : **23UFY2C3P** **Course Category: BSC**
Teaching Scheme: L – T – P **Total Credits: 01**
0 – 0 –2

Course Outcomes: After the completion of the course, student should be able to

CO1	Acquire practical knowledge on the basic chemistry principles for apply in chemical engineering.
CO2	Explain the knowledge of phase diagrams and its application in metallurgy
CO3	Summarize the analytical techniques like conductometric and spectroscopic techniques and solvent extraction process to deal with practical problems.

LIST OF EXPERIMENTS: (PERFORM MINIMUM 8 EXPERIMENTS)

1 To determine the heat of crystallization of CuSO4.5H2O by thermometric method
2 Calculation of the enthalpy of ionization of ethanoic acid by thermometric method.
3 To determine heat of ionization of weak acid by thermometric method.
4 To determine the surface tension & Parachor value of liquid using Stalagmometer.
5 To determine the critical micelle concentration (CMC) of the given surfactant by surface tension measurement using a stalagmometer
6 To study the distribution of succinic acid in H2O- toluene, H2O-ether and comparison of distribution coefficient.
7 To study the KI3 → KI + I2 equilibrium in aqueous solution.
8 To construct the phase diagrams of two components system (phenol- water) and study the effect of 1% NaCl, 1% succinic acid, 0.5% naphthalene on CST in phenol-water systems.

9 To study the phase diagram of ternary system (Toluene-Acetic acid-water; Ethyl acetate-acetic acid, water).
10 To study the distribution of succinic acid in H2O- toluene, H2O-ether and comparison of distribution coefficient.
11 To find out the constant of conductivity cell and hence determine the dissociation constant of a weak acid.
12 To determine the conductometric titration curve in the neutralization of strong /weak acids against a strong/weak bases.

Innovative Experiments:

1. To determine the molecular weight of a high polymer (polystyrene) by viscosity measurement.
2. Iodimetric Titration of Vitamin C

Suggested Self Readings

Text Books

1 Physical Chemistry practical Handbook Yadav
2 Handbook of Analytical Techniques edited by Helmut Gunzler and Alex Williams
3 Experiments in general chemistry by C.N.R. Rao and Agrawal East West Press.
4 Experiments in Physical Chemistry by R.C. Das and Behere Tata Mc Graw Hill.
5 Experimental physical Chemistry by F. Daniel and others (International Student Edition)
6 B. Vishwanathan, P.S. Raghavan; Practical Physical Chemistry, Viva Books, 2010

Course Title: Basics of Electrical & Electronics Engg. **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 Digitalelectronics.

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 Engg. **Semester: II**
Course Code: 23UFY2A4P **Course Category: ESC**
Teaching Scheme: L – T – P – 2 **Total Credits: 010 – 0**

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: Introduction to Chemical engineering **Semester : II**
Course Code : **23UFY228T** **Course Category:PCC**
Teaching Scheme: L-T-P **Total Credits: 022–0–0**

Course Objectives:

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

COURSE OUTCOMES:

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

CO1. Correlate day to day life with the principles of chemical Engineering, Types of reactions & Reactors

CO2. Insight into the basics of fluid flow in Chemical engineering

CO3. Have an insight into area's of energy & mass balance

CO4. Acquire knowledge of the basics of mass & Heat transfer & its applications in unit operations Processes

COURSE CONTENT:

UNIT I INTRODUCTION

Chemical Engineering in day to day life with examples, Origin and growth of chemical Engineers in chemical process industries, unit operations and unit processes concepts, units and dimensions, recent developments in chemical process industries,Types of reactions, The Rate Equation, Types of Reactors **[6Hours]**

UNIT II FUNDAMENTALS OF FLUID MECHANICS

Introductions to Chemical Unit Operations Viscosity, Relationship Between Stress and Strain-Rate for Newtonian Fluids, Incompressible and Compressible Flows, Differences Between Laminar and Turbulent Flows, Newton's Law of Viscosity, Introduction to Non-Newtonian Behavior. Dimensional Analysis buckingham Pi theorem **[6 Hours]**

UNIT III FUNDAMENTALS OF MATERIAL AND ENERGY BALANCE

Conversion of units ,Partial pressure, vapour, Absolute pressure and guage pressure, various laws for pressure , Absolute & Relative Humidity, Introduction to Material Balance, Energy Balance, fundamentals of Energy Balances. wet bulb & Dry bulb temperature, Adiabtic pressure & Temperature **[8Hours]**

UNIT IV FUNDAMENTALS OF HEAT & MASS TRANSFER

Introduction: Diffusion, Mass Transfer Operations, Vapour-Liquid Equilibrium, Relative Volatility, Boiling Point Diagram, Distillation, Reflux, Different Types of Distillation Process, basic concept of drying Humidification , Basic laws governing Conduction, convection & Radiation **[8 Hours]**

Suggested Self Readings

Text Books

1 Anderson, L.B., Wenzel, L.A., "Introduction to Chemical Engineering", McGraw-Hill Book Company, Inc., New York (1961).

2 Pushpavanam, S., "Introduction to Chemical Engineering", PHI Learning Pvt. Ltd.(2012).

3 1. Rao, M.G., Sittig, M., "Dryden's Outlines of Chemical Technology", East-West Press (1997).

4 Ghosal, S.K., Sanyal, S.K., Datta, S., "Introduction to Chemical Engineering", Tata McGraw-Hill Publishing Company Ltd., New Delhi(1997).

Reference Books :

1 Perry, R.H., Green, D.W., "Perry's Chemical Engineers' Handbook", McGraw-Hill Book Company (2008).

Course Title: Fundamentals of Life Sciences **Semester: II**
Course Code: 23UFY229T **Course Category: PCC**
Teaching Scheme: L – T – P **Total Credits: 2**
2 – 0 – 0

Prerequisites: 10+2

Course Objectives: To Familiarize the students with an understanding of foundational biology including concepts like cell structure, genetics, metabolism, photosynthesis, basic biochemical principles, and their engineering applications.

COURSE OUTCOMES: AT THE END OF THE COURSE, THE STUDENT WILL BE ABLE TO:

CO1: Define the basic biological concepts of the structure and function of cells.

CO2: Elucidate the basics of the biomolecule and enzyme.

CO3: Illustrate photosynthesis and energy generation and its utilization by metabolism.

CO4: Explain the fundamentals of Nucleic acids, chromosomes & Mendelian inheritance.

COURSE CONTENT:

UNIT I

History of Biotechnology. Chemical and Biological Evolution. Cell structure (Plant, Animal, Bacteria,and Virus). Major cell organelles and their function. Industrial important Microbial techniques.
[6 Hours]

UNIT II

Introduction to Biomolecules (carbohydrates, proteins, lipids, nucleic acid, and vitamins) and their biological importance. Introduction to enzymes & their industrial applications.

[6 Hours]

UNIT III

Definitions of metabolism (anabolism, catabolism). Photosynthesis I and II. Energy generation and its utilization. The control system in biology: control of blood glucose level, temperature regulation in endothermic animals, and its importance. **[8 Hours]**

UNIT IV

Mendelian Inheritance. Structure of Nucleosides, Nucleotides. Structural organization of chromosomes. Concept of genes & mutations. Introduction to modern tools of biotechnology. **[8 Hours]**

Suggested Self Readings

Text Books

1 Basic Molecular Biology by Avinash Upadhyay, Kakoli Upadhyay, HimalayaPublication.
2 Biochemistry by U. Satyanarayana and U. Chakrapani
3 Fundamentals of Biochemistry by J.LJain, S. Chand and Co
4 Molecular Biotechnology principles & pratices by Channarayappa, UniversitiesPress

Reference Books

1 Lehninger's Principles of Biochemistry by David L. Nelson and Michael M. Cox, W.H. Freeman publication,8th edition.
2 Molecular Biology of the Gene by James D. Watson, A. Baker Tania, P. BellStephen,Gann Alexander, Levine Michael, and Losich Richard.
3 Molecular Cell Biology (9th Edition), Lodish et al, W.H Freeman.

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

Course Title: Skill Enhancement in Instrumental Techniques **Semester: II**
Course Code: 23UFY2A7P **Course Category:SEC2**
Teaching Scheme: L – T – P **Total Credits: 2**
0 – 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.