Chemistry Group (For Batch 2024 onwards)

1st Semester **Contact Hours: 27**

Course Category	Course Code	Course Name	Load Allocated			Credit	Type of Course
			L	T	P		
Basic Science course	BTAC-23101	Chemistry	3	1	0	4	Theory
Basic Science course	BTAM-23101	Engineering Mathematics-I	4	1	0	5	Theory
Engineering Science Courses	BTCS-23101	Programming for Problem Solving	3	0	0	3	Theory
Engineering Science Courses	BTMP-23101	Workshop Manufacturing Practices	1	0	4	3	Practical
Humanities and Social Sciences including Management courses	BTHU-23101	English	2	0	0	2	Theory
Basic Science course	BTAC-23102	Chemistry Lab	0	0	2	1	Practical
Humanities and Social Sciences including Management courses	BTHU-23102	English Lab	0	0	2	1	Practical
Engineering Science Courses	BTCS-23102	Programming for Problem Solving lab	0	0	4	2	Practical
			13	**2**	**12**	**21**	

2nd Semester **Contact Hours: 28**

Course Category	Course Code	Course Name	Load Allocated			Credit	Type of Course
			L	T	P		
Basic Science course	BTPH-23101	Physics	4	1	0	5	Theory
Basic Science course	BTAM-23102	Engineering Mathematics-II	4	1	0	5	Theory
Engineering Science Courses	BTEC-23101	Electrical & Electronics Engineering	3	1	0	4	Theory
Engineering Science Courses	BTME-23101	Engineering Graphics	1	0	4	3	Practical
Engineering Science Courses	BTME-23102	Engineering Mechanics	3	1	0	4	Theory
Engineering Science Courses	BTME-23103	Computer Graphics	0	0	2	1	Practical
Basic Science course	BTPH-23102	Physics Lab	0	0	2	1	Practical
Engineering Science Courses	BTEC-23102	Electrical & Electronics Engineering Lab	0	0	2	1	Practical
			15	**3**	**10**	**24**	

Physics Group (For Batch 2024 onwards)

1st Semester **Contact Hours: 28**

Course Category	Course Code	Course Name	Load Allocated			Credit	Type of Course
			L	T	P		
Basic Science course	BTPH-23101	Physics	4	1	0	5	Theory
Basic Science course	BTAM-23101	Engineering Mathematics-I	4	1	0	5	Theory
Engineering Science Courses	BTEC-23101	Electrical & Electronics Engineering	3	1	0	4	Theory
Engineering Science Courses	BTME-23101	Engineering Graphics	1	0	4	3	Practical
Engineering Science Courses	BTME-23102	Engineering Mechanics	3	1	0	4	Theory
Engineering Science Courses	BTME-23103	Computer Graphics	0	0	2	1	Practical
Basic Science course	BTPH-23102	Physics Lab	0	0	2	1	Practical
Engineering Science Courses	BTEC-23102	Electrical & Electronics Engineering Lab	0	0	2	1	Practical
			15	**3**	**10**	**24**	

2nd Semester **Contact Hours: 27**

Course Category	Course Code	Course Name	Load Allocated			Credit	Type of Course
			L	T	P		
Basic Science course	BTAC-23101	Chemistry	3	1	0	4	Theory
Basic Science course	BTAM-23102	Engineering Mathematics-II	4	1	0	5	Theory
Engineering Science Courses	BTCS-23101	Programming for Problem Solving	3	0	0	3	Theory
Engineering Science Courses	BTMP-23101	Workshop Manufacturing Practices	1	0	4	3	Practical
Humanities and Social Sciences including Management courses	BTHU-23101	English	2	0	0	2	Theory
Basic Science course	BTAC-23102	Chemistry Lab	0	0	2	1	Practical
Humanities and Social Sciences including Management courses	BTHU-23102	English Lab	0	0	2	1	Practical
Engineering Science Courses	BTCS-23102	Programming for Problem Solving lab	0	0	4	2	Practical
			13	**2**	**12**	**21**	

BTAC-23101 Chemistry

L T P C
3 1 0 4

Course Objectives

The course will introduce the basic concepts of quantum chemistry, bonding, stereochemistry,and students will be made familiar to synthesis methodologies and reactivity of organic compounds..

1. **Introduction to quantum theory for chemical system:** Schrodinger equation, Applications to Hydrogen atom, Atomic orbitals, many electron atoms. (6)

2.Chemical bonding in molecules: MO theory Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, (6)

3.Introduction to Stereochemistry: Stereodescriptors – R, S, E, Z. Enantiomers and Diastereomers. Racemates and their resolution. Conformations of cyclic and acyclic systems.(7)

4 .Reactivity of organic molecules Factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. Thermodynamic control of reactions. (8)

5.Strategies for synthesis of organic compounds Reactive intermediates substitution, elimination, rearrangement, kinetic and thermodynamic aspects, role of solvents. (8)

6.**Hardness of water** :Types of hardness , Disadvantage of Hard Water, Different methods of the water Softening of Hardwaterr, Water for domestic Use, Disinfection of water. (6)

Course Outcome (Co)

After successful completion of BTAC-23101

1.Students will gain knowledge of the quantum and geometry of atoms and the three-dimensional structure of organic molecules.

2.Students will learn the reactivity and stability of an organic molecules based on structure .

3.Students will gain the knowledge of confirmation and stereochemistry of organic compunds .

4.Students will learn the properties of water, softening of water for industrial use.

Text Books

1.Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi

2.Engg. Chemistry, Jain & Jain, Dhanpat Rai & Co. (P) Ltd.

3. Conceptual Engineering Chemistry,Dr. S.K. Bhasin, Ajay publications

4.Interactive Engineering Chemistry, R.P. Singh Garewal,Kalyani Publishers.

Reference Book

1.Engineering Chemistry, John Wiley, Wiley India Pvt. limited

2.Essentials of Physical chemistry ,Bahl &Tuli, S. Chand P Chand Publishing.

3.Applied Chemistry, Sunita Rattan, Kataria

4.Organic Chemistry, Subrata Sen Gupta

BTAC-23102 Chemistry Lab

L	T	P	C
0	0	3	1.5

Course Objective: The objective of the course is to develop a scientific temper and analytical capability in the engineering graduates through the learning of Chemical concepts and their application in engineering & technology.

List ofexperiments

1 Determination of surface tension and viscosity

2. Thin Layer Chromatography

3 Ion exchange column for removal of hardness of water

4.Colligative properties using freezing point depression

5. Determination of the rate constant of a reaction

6. Determination of cell constant and conductance of solutions

7. Potentiometry-determination of redox potentials and emf

8 Synthesis of a polymer/drug

9. Saponification/acid value of an oil

10. Chemical analysis of a salt

11. Lattice structures and packing of spheres

12. Models of potential energy surfaces

13. Chemical oscillations- Iodine clock reaction

14 Determination of the partition coefficient of a substance between two immiscible liquids

15.Adsorption of acetic acid by charcoal

16. Use of the capillary viscometers to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

Course Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

The students will learn to:

1. Estimate rate constants of reactions from concentration of reactants/products as a function of time.

2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.

3. Synthesize a small drug molecule and analyse a salt sample.

BTHU-23101 English

L	T	P	C
2	0	0	2

Course Objective: The objective of the course is to help the students become the independent users of English language. Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.

1. Vocabulary Building: The concept of Word Formation **,**Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to formderivatives., Synonyms, antonyms, and standard abbreviations. (7)

2. Basic Writing Skill : Sentence Structures , Use of phrases and clauses in sentences , Importance of proper punctuation , Creating coherence, Organizing principles of paragraphs in documents , Techniques for writing precisely (6)

3. Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers ,Articles , Prepositions , Redundancies , Clichés (6)

4. Nature and Style of sensible Writing: Describing, Defining,Classifying ,Providing examples or evidence , Writing introduction and conclusion (5)

5. Writing Practices: Comprehension, Précis Writing, Essay Writing (4)

Course Outcomes:

1. Students will be able to communicate and write English language, particularly the language of their chosen technical field.

2. They will be able to converse fluently.

3. They will be able to produce on their own clear and coherent texts.

Text Books

Martin's English Grammar
Practical English Usage.Michael Swan. OUP 1995
Communication Skills for Professionals and Students. Dr. Amitabh Dwivedi

Reference Books

(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(v) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

BTHU-23102 English Lab
(Oral Communication)

L	T	P	C
0	0	2	1

Course Objective: The objective of the course is to help the students become the independent users of English language.

This unit involves interactive practice sessions in English Lab and will comprise of the following:

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

Reference Books

(i) Martin's English Grammar
(ii) Practical English Usage. Michael Swan. OUP. 1995.
(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv)Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(v) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes:

1.Students will acquire basic proficiency in listening and speaking skills.
2.Students will be able to speak and write English language, particularly the language of their chosen technical field.
3.They will be able to converse fluently
4.They will be able to produce on their own clear and coherent texts.

BTHU-23102 English Lab
(Oral Communication)

L	T	P	C
0	0	2	1

Course Objective: The objective of the course is to help the students become the independent users of English language.

This unit involves interactive practice sessions in English Lab and will comprise of the following:

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

Reference Books

(i) Martin's English Grammar
(ii) Practical English Usage. Michael Swan. OUP. 1995.
(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv)Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(v) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes:

1.Students will acquire basic proficiency in listening and speaking skills.
2.Students will be able to speak and write English language, particularly the language of their chosen technical field.
3.They will be able to converse fluently
4.They will be able to produce on their own clear and coherent texts.

BTAM-23101
Engineering Mathematics-I
(Common to all B.Tech branches except Biotech)

L	T	P	C
4	1	0	5

Course Objective:

The purpose of Mathematics in engineering education is to inculcate in the budding engineers the mathematical competence which is the ability to understand, analyze and use mathematics in a variety of contexts such as Differential, Integral and Vector Calculus.

1. Differential Calculus:
Curve tracing: Tracing of Standard Cartesian; Parametric and Polar curves (Astroids, Cycloids, Folium Tubes Cardiods, Lemniscate, Helix); Curvature of Cartesian, Parametric and Polar curves. (6)

2. Integral Calculus:
Rectification of standard curves; Areas bounded by standard curves, Applications of integral calculus to find centre of gravity and moment of inertia. (6)

3. Partial Derivatives:
Function of two or more variables; Partial differentiation; Homogeneous functions and Euler's theorem; Composite functions; Total derivative; Derivative of an implicit function; Change of variable; Jacobians (6)

4. Applications of Partial Differentiation:
Tangent and normal to a surface; Taylor's and Maclaurin's series for a function of two variables; Errors and approximations; Maxima and minima of function of several variables; Lagrange's method of undetermined multipliers (6)

5. Multiple Integrals:
Double and triple integral and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes. (6)

6. Vector Calculus:
Scalar and vector fields, differentiation of vectors, velocity and acceleration. Vector differential operators: Del, Gradient, Divergence and Curl, their physical interpretations Formula involving Del applied to point functions and their products. Line, surface and volume integrals. (8)

7. Application of Vector Calculus:
Flux, Solenoidal and Irrotational vectors. Gauss Divergence theorem. Greens theorem in plane, Stokes theorem (without proofs) and their applications. (6)

Course Outcomes:

CO-1 Apply the concept and principles of differential calculus to find the curvature, concavity and points of inflection, envelopes, rectilinear asymptotes of different curves.

CO-2 Come to know the applications of double and triple integration in finding the area and volume.

CO-3 To know the claim rule and use it to find derivatives of composite functions. Find Partial derivatives of multivariable functions and to use the Jacobin in practical problems.

CO-4 To find maxima and minima, critical points and inflection points of functions.

CO-5 Able to solve qualitative problems based on vector analysis and Know about qualitative applications of Gauss, Stoke's and Green's theorem.

Text Books:

1. Thomes, G.B, Finney, R.L. Calculus and Analytic Gemetry, Ninth Edition,Peason Education.

2. Kreyszig, E., Advanced Engineering Mathematics, Eighth edition, John wiley.

3. Jain, R.K and Lyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing Company.

4. B. V. Ramana, Higher Engineering mathematics,Tata Mcgraw Hills, New Delhi

Reference Books:

1. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers,New Delhi.

2. Bali, N.P, Paul Usha, Engineering Mathematics, Luxmi Publications.

BTBM-23101
Engineering Mathematics-I
(For Biotechnology Branch)

L	T	P	C
4	1	0	5

Course Objectives:

This course is designed to provide an introduction to the fundamental concepts in Mathematics. After the completion of this course prospective students will be able to apply the concepts of basic Mathematics in the professional course.

1. **Algebra:** AP, GP, HP, Theory of equations, Bionomial Theorem, Logarithmic & Exponential series. (6)

2. **Trigonometry:** Basic trigonometric formulae, Simple trigonometrical equations. (6)

3. **Co-ordinate Geometry:** Straight lines, Circle, Conics (ellipse, hyperbola and parabola), Pair of straight lines. (6)

4. **Matrices:** Matrix, Determinants, Adjoints, Matrix operations, Inverse of a matrix and Properties of determinants. (6)

5. **Calculus:** Concepts of Limit, Continuity, Derivative, Evaluation of Derivatives. (6)

6. **Integral Calculus:** Introductions of Indefinite and Definite Integrals, Integration of trigonometrically Functions, Integration by substitution and Integration by part. Properties of definite integrals. (6)

7. **Complex Numbers:** Introduction to complex numbers, Conjugate, Modulus, Inverse of a complex number. (6)

Course Outcomes: Upon successful completion of this course students will be able to

Co-1 Demonstrate algebraic facility with algebraic topics including linear, quadratic,exponential, logarithmic, and trigonometric functions.

CO-2 Compute limits and derivatives of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic.

CO-3 Determine the continuity and differentiability of a function at a point and on a set.

CO-4 Compute definite and indefinite integrals of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic.

CO-5 Solve systems of linear equations by use of the matrix.

CO-6. Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers.

Text Books:

1. NCERT Mathematics Text book for XI and XII
2. Narain, S., Differential Calculus.
3. Narain, S., Integral Calculus.

Reference Books:

1. Sharma, R.D., Mathematics, Dhanpat Rai Publications, New Delhi.
2. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers,New Delhi.

BTAM-23102, Engineering Mathematics-II
(Common to all B.Tech branches)

L	T	P	C
4	1	0	5

Course Objectives:

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering. To make aware students about the importance and symbiosis between mathematics and engineering.

1. Ordinary Differential Equations of first order

Exact Differential equations, Equations reducible to exact form by integrating factors; Equations of the first order and higher degree. Clairaut's equation. Leibniz's linear and Bernoulli's equation. (7)

2. Linear Ordinary Differential Equations of second & higher order

Solution of linear Ordinary Differential Equations of second and higher order; methods of finding complementary functions and particular integrals. Special methods for finding particular integrals: Method of variation of parameters, Operator method. Cauchy's homogeneous and Legendre's linear equation, Simultaneous linear equations with constant coefficients. (7)

3. Applications of Ordinary Differential Equations

Applications to electric R-L-C circuits, Deflection of beams, Simple harmonic motion, Simple population model. (7)

4. Linear Algebra

Rank of a matrix, Elementary transformations, Linear independence and dependence of vectors, Gauss-Jordan method to find inverse of a matrix, reduction to normal form, Consistency and solution of linear algebraic equations, Linear transformations, Orthogonal transformations, Eigen values, Eigen vectors, Cayley-Hamilton Theorem, Reduction to diagonal form, orthogonal, unitary, Hermitian and similar matrices. (7)

5. Infinite Series

Convergence and divergence of series, Tests of convergence (without proofs): Comparison test, Integral test, Ratio test, Rabee's test, Logarithmic test, Cauchy's root test and Gauss test. Convergence and absolute convergence of alternating series. (7)

6. Complex Numbers and elementary functions of complex variable

De-Moivre's theorem and its applications. Real and Imaginary parts of exponential, logarithmic, circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables. Summation of trigonometric series. (C+iS method) (7)

Course outcomes: Upon successful completion of this course students will be able to learn

CO1: To understand the formation of Differential equation from the given physical problems and to solve first order ordinary differential equation by various methods.

CO-2 Know about necessary and sufficient condition for total differential equations. Further students know about order of differential equations and their transformations and solutions through methods.

CO3: To be able to apply the knowledge of first order and Higher order differential equation in different engineering applications.

CO4: Solve systems of linear equations by using elementary row operations and determine eigen values and eigen vectors of given square matrix also compute power, inverse of the matrix using Cayley Hamilton theorem.

CO5: To understand the convergence and divergence of infinite series and to evaluate successive differentiation.

CO-6: To understand the De Moivre's theorem students will be able to calculate powers of complex numbers. Identify curves and regions in the complex plane defined by simple expressions.

Reference Books:

1. Kreyszig,E., Advanced Engineering Mathematics, Eighth edition, John Wiley.
2. Michael D. Greenberg., Advanced Engineering Mathematics, Second Edition, Pearson Education.
3. Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth- Publishing Company.
4. Jain, R.K. and Iyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing House, New Delhi.
5. Pipes, L.A. and Harvill, L.R., Applied Mathematics for Engineers and Physicists, McGraw Hill
6. Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, 1. K. Publisher.

Text Books:

1. Bindra, J. S., Applied Mathematics, Volume-II, Kataria Publications.
2. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi.
3. Babu Ram, Advance Engineering Mathematics, Pearson Education.

BTCS-23101 Programming for Problem Solving

L	T	P	C
3	0	0	3

Course Objective: This course has been designed to introduce the basic concepts of computer systems and programming to all the undergraduate students of Engineering.

Introduction to computer systems:

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) (2)

Introduction to Programming:

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples, From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code. (4)

Arithmetic expressions and precedence: (2)

Conditional Branching and Loops :

Writing and evaluation of conditionals and consequent branching, Iteration and loops (4)

Arrays:

Arrays (1-D, 2-D), Character arrays and Strings (6)

Basic Algorithms :

Searching (Linear Search), Basic Sorting Algorithms (Bubble Sort), Finding roots of Equations. (6)

Function :

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference (5)

Recursion:

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series. (5)

Structure:

Structures, Defining structures and Array of Structures (4)

Pointers :

Idea of pointers, Defining pointers, (4)

File handling (only if time is available, otherwise should be done as part of the lab)

Course Outcomes : The student will learn

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To use arrays, pointers and structures to formulate algorithms and programs.
6. To apply programming to solve simple programming problems, namely root finding of function, differentiation of function and simple integration.

Text Books

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI

BTCS-23102 Programming for Problem Solving Lab

L	T	P	C
0	0	4	2

Course Objective: This course has been designed for the hands on practice of working on computer systems and programming.

Tutorial1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial5: 1D Arrays: Linear search, Bubble sort
Lab 5: 1D Array manipulation

Tutorial6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial7: Functions, call by value, call by reference:
Lab 7: Simple functions

Tutorial8&9: Finding roots of quadratic equation.
Lab 8 and 9: Programming for Finding roots of quadratic equation.

Tutorial10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial11: Pointers, structures
Lab 11: Pointers and structures

Tutorial12: File handling:
Lab 12: File operations

Course Outcomes: The students will learn

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

BTME-23102 Engineering Mechanics

L	T	P	C
3	1	0	4

Course Objective: The main objective of this course is to develop in the student the ability to analyze any engineering problem in a simple and logical manner with the help of free body diagrams and then to apply the basic principles of mechanics to solve the problem. The students should develop skills to apply equilibrium equations of statics to various problems to determine reactions and also could determine centre of gravity and moment of inertia of various bodies. Students would be introduced to the basic concepts of mechanics of deformable materials.

1. Force and Force Equilibrium

Force, System of forces, Coplanar concurrent & non-concurrent force, Non-coplanar concurrent & non-concurrent force, Couples and resultant of force systems, Equilibrium of force system (two and many force system), Lami's theorem, General equations of equilibrium for rigid-body, Rigid body constraints, Concept of free-body diagrams, Resultant moment of forces, Varingnon's theorem and its applications, Numerical Problems. (8)

2. Friction

Types of friction, Limiting friction, Static and dynamic friction, Laws of dry friction, Determination of coefficient of sliding friction, Rolling resistance, Force of friction on a wheel when a force is applied & when acted upon by torque, Motion of bodies on inclined plane, wedge friction, screw jack. (8)

3. Centroid and Centre of Gravity

Center of Gravity and Center of Mass for a Body, Centroid of simple figures from first principle, Centroid of composite sections. (4)

4. Moment of Inertia

Area moment of inertia, Moment of inertia of plane sections from first principles, Parallel and perpendicular axes theorem of Moment of inertia, Moment of inertia of standard sections and composite sections, Mass moment of inertia of cylinder, cone and sphere. (7)

5. Review of Particle Dynamics

Rectilinear motion with uniform and variable acceleration, Displacement, velocity and acceleration of connected bodies, Equations of dynamic equilibrium, Analysis of motion of elevators and motion of pulleys. Plane curvilinear motion with components of motion as rectangular components, Normal & tangential components, Collision of elastic bodies; Direct central impact, Nature of impact and the coefficient of restitution. (7)

6. Introductions to Kinetics of Rigid Bodies

Basic terms, General principles in dynamics, Plane motion of a rigid body, Relation between the translatory and rotary motion of a body in plane motion, D'Alembert's Principle in plane motion, Instantaneous centre of rotation in plane motion and simple problems. (6)

Course Outcomes:

1. Understand the meaning of Engineering Mechanics.
2. Solve the Problem related to the behavior of a rigid body due to an external load.
3. Solve, analyze and design moment of inertia of plain figures.
4. Analyze the mass moment of solid objects.
5. Apply the Work-Energy equation and impulse-Momentum equation.
6. Analysis and Solve friction related problems.

Suggested Books:

1. Stephan Timoshenko and D. Young, Engineering Mechanics, Tata McGraw Hill.
2. S. S. Bhavikatti, K. G. Rajashekarappa , Engineering Mechanics, New Age International.
3. Engineering Mechanics – Irving H. Shames, PHI Publications
4. Engineering Mechanics – U.C.Jindal, Galgotia Publications
5. Tayal A.K. Engineering Mechanics,Umesh Publications
6. Bansal R.K. A Text Book of Engineering Mechanics, Laxmi Publications
7. Engineering Mechanics By R S Khurmi,S Chand Publication

BTMP-23101 Workshop Manufacturing Practices (Theory and Lab)

L	T	P	C
1	0	4	3

Course Objective:

1. Define and identify various manufacturing processes.
2. Describe different manufacturing processes commonly employed in industry
3. Fabricate small components using different manufacturing processes.

1. Carpentry Shop

Types of timbers, defects in timber, seasoning of wood; tools, wood operation and various joints; exercises involving use of important carpentry tools to practice various operations and making joint

2. Foundry Shop

Introduction to molding materials; moulds; use of cores; melting furnaces; tools and equipment used in foundry shops; firing of a cupola furnace; exercises involving preparation of small sand moulds and castings.

3. Forging Shop

Introduction to forging tools; equipments and operations; forgability of metals; exercises on simple smithy; forging exercises.

4. **Machine Shop**

Machines, Grinders etc; cutting tools and operations; exercises on small work pieces.

5. Welding Shop

Introduction to different welding methods; welding equipments; electrodes; welding joints; welding defects; exercises involving use of gas and electric arc welding.

6. **Electrical and Electronics**

Shop Introduction to electrical wiring; preparation of PCBs involving soldering applied to electrical and electronic applications; exercises on preparation of PCBs involving soldering applied to electrical and electronic applications.

7. **Practice in Sheet Metal Shop**

Shop development of surfaces of various objects; sheet metal forming and joining operations, joints, soldering and brazing; exercises involving use of sheet metal forming operations for small joints.

8**. Fitting Shop**

Introduction of fitting and tools used in fitting shop; exercise involving marking, cutting, fitting

Course Outcomes

1. Understand the Various manufacturing Processes.
2. Classify the manufacturing processes commonly employed in industry.
3. Fabricate small components using different manufacturing processes.
4. Capable to use the various methods to manufacture a product in industry.

Suggested Books

1. Raghuwanshi, B.S. ; A Course in Workshop Technology, Vol. 1 & II, Dhanpat Rai & Sons, New Delhi.
2. Jain, R.K.; Production Technology, Khanna Publishers, New Delhi.
3. Singh, S., ; Manufacturing Practice, S.K. Kataria & Sons, New Delhi

Engineering Graphics (BTME-23101)

L	T	P	C
1	0	4	3

Course Objectives:

Main objective of Engineering Drawing is to introduce the students to visual science in the form of technical drawing. General instructions related to theory of projection of points, lines, planes. Section of solids and development of surfaces, isometric projection and orthographic projection of simple solids/blocks will further upgrade the basic understanding and visualization of geometrical objects and to certain extent the machine parts.

1. Introduction:

Introduction to engineering drawing and Graphics, Role of drawing in engineering, Dimensioning, Concepts of scale in drawing, Representative Fraction, Type of Scale, Plain and Diagonal Scale. (3)

2. Projection of Points:

Principle of Projection, Method of projection, Planes of projection, Four quadrant, first and third angle projection, Reference line, symbols for methods of projection, Orthographic projection, Projection of Point, Point situated in first, second, third & fourth quadrant. (3)

3. Projection of lines:

Line parallel to one or both the planes, Line contained by One or both the planes, Line perpendicular to one of the planes, Line inclined to one plane and parallel to other. Line inclined to both the planes, Traces, Simple demonstrations only. (4)

4. Projection of Planes:

Types of planes, Projection of planes, Projection of planes perpendicular to both the reference planes, Perpendicular to one plane and parallel to other plane, Perpendicular to one plane and inclined to the other plane, Inclined to both planes, Simple demonstrations only. (4)

5. Projection of Solids and Section of Solids:

Type of solid, Projections of solids in simple position, Projection of solids with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P. Section of Solids, Sectional Planes, True Shape of Section, Simple demonstrations only. (4)

6. Development of Surfaces:

Method of development, Development of lateral surfaces of right solids, Cube, Prisms, Cylinders, Pyramids & Cone. (4)

7. Isometric Projection:

Classification of pictorial views, Isometric axes, Lines & planes, Isometric scale, Isometric projection and Isometric view, Conversion of Isometric to Orthographic Projections. Isometric projection of solids such as cube, prism, pyramid and cylinder, Simple demonstrations only. (4)

8. Orthographic Projection:

Orthographic Projection Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts. (4)

Course Outcomes:

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

1. Understand the meaning of Engineering Drawing.
2. Solve the Problem related to the Dimensioning, scale, points and line.
3. Solve the problems related to projection, section, development of solids.
4. Construct various engineering components using orthographic and isometric projection.

Text Books:

1. Gill P S, "Engineering Graphics and Drafting", Katria and Sons, Delhi.
2. Bhat N D, "Elementary Engineering Drawing-Plane and solid Geometry", Chartotar Publishing House, Anand.
3. Johle D A, "Engineering Drawing", Tata McGraw Hill Education Private Limited, New Delhi.
4. Agrawal B, Agrawal C M, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi.

Computer Graphics (BTME-23103)

L	T	P	C
0	0	2	1

Objectives:

This course is designed to introduce computer aided drafting software to carry out operations such as drawing and modifications of entities like points, lines, arcs, circles and primitatives like cube, cylinder, cone; dimensioning, sectioning and orthographic projections of these entities and primitatives.

Using any computer aided drafting software:

1. Draw simple entities like lines, circle, arc, polygon, ellipse etc.
2. Modify existing entities by using commands like extend, trim, scale, copy, move etc.
3. Modify existing entities by using commands like hatching, fillet, chamfer, array etc.
4. Dimension 2D entities in different layers.
5. Convert 2D standard entities into standard primitives such as cube, cylinder, cone etc.
6. Draw various primitatives using commands like extrude, revolve, union and subtraction
7. Draw engineering components such as Bush, V- Block etc.
8. Perform sectioning of solids along any given plane.

Expected outcome:

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

1. Draw various types of entities in any computer aided drafting software.
2. Draw various types of primitives in any computer aided drafting software.
3. Modify various types of entities and primitives.
4. Apply different types of dimensioning to various entities and primitives.
5. Perform sectioning of solids along any given plane.

Text Books:

1. Learn AutoCAD by Sunil Kumar Pandey

BTEC 23101: Electrical & Electronics Engineering

L	T	P	C
3	1	0	4

Course Objective

This course gives a basic knowledge of electric circuits, electrical machines,semiconductor devices and digital electronics with which a building of innovative technology can be created. The course is mandatory for all the branches for understanding the basic concepts of Electrical and Electronics Engineering for laying foundations of today's and tomorrow's technology as the students of all branches have to deal with the applications of Electrical and Electronics Engineering.

Course Contents:

DC & AC Circuits

Difference between DC & AC Quantities, Instantaneous Value, RMS Value, Average Value, Form Factor of sinusoidally varying ac; Introduction to Resistor, Inductor & Capacitor and their behaviour on DC & AC. Kirchoff‟s Laws, Analysis of DC Circuits by Nodal Analysis, Mesh Analysis and Superposition Theorem.

Analysis of AC Circuits; Series RL,RC & RLC Circuits subjected to sinusoidal input,Concept of Impedance and its representation in Rectangular and polar forms, Resonance in series and parallel circuits. Introduction to 3 phase systems, Star & Delta Connections(Introduction only). **[10]**

Magnetic Circuits and Transformer

Laws of Electromagnetic Induction.Concept of Self Induced & Mutually Induced EMFs, Force on a Current Carrying Conductor placed in Magnetic Field.

Single Phase Transformer: Construction, Working principle, EMF Equation,Losses,Concept of losses occuring at open circuit and short circuit conditions (introduction only), Efficiency. **[7]**

Rotating Electrical Machines

Construction & Principle of operation of 3 phase Induction motor. Classification of 3 Phase Induction Motors & their Applications. Construction of single phase induction motors, Principle of Operation and applications..

Construction of DC Machines, Principle of operation of D.C. motor & generator. Types of DC Motors & their applications. Introduction to Stepper motor. **[8]**

Semiconductor Devices

Principle of operation characteristic and application of PN Junction Diode, Zener Diode, Rectifiers, Principle of operation & characteristic of Bipolar Junction Transistor, Principle of operation & characteristic of Field Effect Transistor, Regulated Power Supply. **[9]**

Digital Electronics

Binary, Octal and Hexadecimal number System and their arithmetic operations, Logic gates, Introduction of R-S, J-K, D and T Flip Flops and their truth tables. **[8]**

Course OutComes: After successful completion of this course, students will be able to

1. Acquire knowledge about basic concepts of D.C quantities, A.C quantities, three phase systems and semiconductor devices.
2. Learn different methods to solve electric circuits.
3. Analyse magnetic circuits and transformers.
4. Familarise with different A.C and DC motors and their applications.
5. Design simple digital circuits.

Suggested Readings/Books

1. Basic Electrical & Electronics and Computer Engg. By R Muthusubramaniam, S Salivahanan, K A Muralidharan, Tata Mcgraw Hill.
2. Electrical Engg Fundamentals by Vincent Del Toro, PHI.
3. A text book of Electrical technology by B. L. Threja, S. Chand publishers.
4. Electrical Technology by Edward Hughes, Adison Wesley Longman Limited.

BTEC 23102: Electrical & Electronics Engineering Laboratory

L	T	P	C
0	0	2	1

Course Objective

This course intends to impart practical knowledge about the applications of electric circuits, electrical machines,semiconductor devices and digital electronics. The course is mandatory for all the branches for understanding the basic concepts of Electrical and Electronics Engineering for laying foundations of today's and tomorrow's technology as the students of all branches have to deal with the applications of Electrical and Electronics Engineering.

Atleast 10 experiments to be performed. Subject teacher can introduce new experiment as per the requirements of the syllabus.

List of Experiments

1. To measure power and power factor in single phase AC Circuit.
2. To verify the voltage and current relations in three phase star & delta connected systems.
3. To use a bridge rectifier for full-wave rectification of AC supply and to determine the relationship between RMS and average values of the rectified voltage.
4. To measure the minimum operating voltage, current drawn, power consumed, and the power factor of a fluorescent tube light.
5. To study the working of LVDT and to plot its characteristics.
6. To study various parts of (i)Transformer (ii) DC Motor
7. To study various parts of (i) 3 Phase Induction Motor (ii) Single phase induction motor
8. To verify the rating of compact fluorescent lamp (CFL).
9. To obtain the characteristics of a P-N junction diode.
10. To start and reverse the direction of rotation of a DC motor.
11. To start and reverse the direction of rotation of 3 phase Induction motor.
12. To verify the truth table of logic gates.
13. To obtain the characteristics of a transistor under common emitter (CE) configuration.
14. To perform open- and short circuit tests on a single phase transformer and find iron loss & Cu loss.

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

1. Formulate and analyze electrical circuits practically.
2. Implement theoretical concepts of electrical machines and transformers.
3. Recognize and select various electrical machines according to the applications.
4. Interpret semiconductor devices and logic gates.
5. Apply the ethical principles for troubleshooting of electrical and electronic devices.

BTPH-23101
PHYSICS

L	T	P	C
4	1	0	5

Course Objective: Course Objective: The objective of the course is to develop a scientific temper and analytical capability in the engineering graduates through the learning of physical concepts and their application in engineering & technology.

1. Electromagnetic waves: Physical significance of Gradient, Divergence & Curl, displacement Current, Types of polarization, Maxwell‟s Equations, Equation of EM waves in free space, velocity of EM waves, Poynting vector.

2. Magnetic Materials & Superconductivity: Basic ideas of Dia, Para, Ferro & Ferri, Ferrites, Superconductivity, Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & Type II superconductors, London Equations, Introduction to BCS theory.

3. Elements of Crystallography: Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes & Directions in cubic system, Continuous & Characteristic X-Rays, X-Ray Diffraction & Bragg's law in Crystals, Bragg‟s spectrometer.

4. Lasers: Spontaneous & Stimulated emissions, Einstein‟s Coefficients, Population Inversion, Pumping Mechanisms, Components of a laser System, Three & four level laser systems; Ruby, He-Ne, CO_2 and semiconductor Lasers, Introduction to Holography.

5. Fibre Optics: Introduction, Acceptance Angle, Numerical Aperture, Normalized frequency, Modes of propagation, material dispersion & pulse broadening in optical fibres, fibre connectors, splices and couplers, applications of optical fibres.

4. Quantum Theory: Need and origin of quantum concept, Wave-particle duality, Matter waves, Group & Phase velocities, Uncertainty Principle, Significance & normalization of wave function, Schrodinger wave equation: time independent & dependent, Eigen functions & Eigen values, particle in a box.

Course outcome:

- Comprehension of some basic physical concepts will enable graduates to think logically the engineering problems that would come across due to rapidly developing new technologies.
- The student will be able to understand the various concepts effectively; logically explain the physical concepts; apply the concept in solving the engineering problem; realize,

Text Books

1. Engineering Physics, Malik; HK, Singh; AK, Tata McGraw Hill,
2. Materials Science & Engg., Raghvan V.,Prentice Hall of India.
3. Concepts of Modern Physics, Beiser; A., Mahajan; S., Choudhary; SR, Tata McGraw Hill.
4. Introduction to Solids, Azaroff LV, Tata Mc Graw Hill.
5. Materials Science & Engineering, Callister; WD, John Wiley & Sons.
6. Introduction to Electrodynamics, Griffiths; DJ, Prentice Hall.
7. Optical Fibre system, Technology, Design & Applications, Kao; CK, McGraw Hill.
8. Laser Theory & Applications, Thygrajan; K, Ghatak; AK, Mc Millan India Ltd.

BTPH-23102

PHYSICS LAB.

L	T	P	C
4	1	0	5

Course Objective: Course Objective: The objective of the course is to develop a scientific temper and analytical capability in the engineering graduates through the learning of physical concepts and their application in engineering & technology.

Note: Students are required to perform 10 experiments in relevance to their branch from the list given below:

Experiment 1: Rigidity modulus of a material – Torsional pendulum
Experiment 2: To determine the Moment of Inertia of a Flywheel.
Experiment 3: To determine the Elastic Constants/Young's Modulus of a Wire by Searle's method
Experiment 4: To determine g by Kater's Pendulum.
Experiment 5: To find the moment of inertia of an irregular body about an axis through its C.G with the torsional pendulum.
Experiment 6: To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine: (i) Radius of gyration of the bar about an axis through its C.G. and perpendicular to its length. (ii) The value of g in the laboratory.
Experiment 7: To determine the Height of an object using a Sextant.
Experiment 8: Determination of beam divergence and beam intensity of a given laser.
Experiment 9: To find the velocity of ultrasound in liquid.
Experiment 10: To find out the frequency of AC mains using electric-vibrator
Experiment 11: To determine the angle of prism and angle of minimum deviation for given prism – Spectrometer
Experiment 12: To find the refractive index of a material using spectrometer Experiment 13: Time Constant of RC Circuit
Experiment 14: Resonance in LCR circuit
Experiment 15: To study the series/parallel LCR circuit and determine its (a) Resonant Frequency, (b) Quality.
Experiment 16: Magnetic field along the axis of a coil (Stewart & Gee's method)
Experiment 17: To study B-H curve using CRO.
Experiment 18: Numerical Aperture, acceptance angle and Bending Losses in Optical fiber
Experiment 19: Wavelength of Light-Diffraction Grating-Using LASER
Experiment 20: Newton's Rings Experiment
Experiment 21: To study laser interference using Michelson's Interferometer.
Experiment 22: To determine the wave length of light used using diffraction grating.
Experiment 23: To determine the Planck's constant from kinetic energy versus frequency graph
Experiment 24: To determine the stopping potential from the photocurrent vs.applied potential graph.
Experiment 25: V-I Characteristics of Solar Cell.
Experiment 26: To determine the band gap of a semiconductor.
Experiment 27: To determine the resistivity of a semiconductor by four probe method
Experiment 28: To study the Hall Effect for the determination of charge current densities
Experiment 29: To study the characteristic of different p-n junction diode- Ge and Si.
Experiment 30: Energy gap of a material of p-n junction
Experiment 31: To determine unknown capacitance by flashing and quenching method.
Experiment 32: To study the characteristic of Zener diode.
Experiment 33: Study and proof of Malus' law in polarization.

Course outcome:

- Comprehension of some basic physical concepts will enable graduates to think logically the engineering problems that would come across due to rapidly developing new technologies.
- The student will be able to understand the various concepts effectively; logically explain the physical concepts; apply the concept in solving the engineering problem; realize,
- Understand and explain scientifically the new developments and breakthroughs in engineering and technology.

Reference Books: Following reference books may be useful for further reading in Physics or Instrumentation relevant to the experiments:

1. "Fundamentals of Physics", 6th Ed., D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, Inc., New York, 2001.
2. "Physics", M. Alonso and E.J. Finn, Addison Wesley, .1992.
3. "The Feynman Lectures in Physics (Vols. 1, 11 and 111)", R.P. Feynman, R.B. Leighton and M. Sands, Addison Wesley, 1963.
4."Fundamentals of Optics", 4th Ed., F.A. Jenkins and H.E. White, McGraw-Hill Book Co., 1981.
5. "Optics", A Ghatak, Tata-McGraw Hill, New Delhi, 1992
6. "Vibration and Waves", A.P. French, Arnold-Heinemann, New Delhi, 1972.
7. "Students Reference Manual for Electronic Instrumentation Laboratories", S.E. Wolf and R.F.M. Smith, PHI, 1990.
8. "Basic Electronic Instrument Handbook", C.F. Coombs, McGraw-Hill Book Co., 1972.
9. "Laboratory Experiments in College Physics", C.H. Bernard and C.D. Epp, John Wiley and Sons, Inc., New York, 1995.
10. "Practical Physics", G.L. Squires, Cambridge University Press, Cambridge, 1985.
11. "Great Experiments in Physics", M.H. Shamos, Holt, Rinehart and Winston Inc.,1959.
12. "Experiments in Modern Physics", A.C. Melissinos, Academic Press, N.Y., 1966.
13. "Reliable Knowledge", J.Ziman, Cambridge University Press, Cambridge, 1978.
14. "Introductory Readings in the Philosophy of Science", Edited by E.D. Klenke, R. Hollinger, A.D. Kline, Prometheous Books, Buffalo, New York, 1988.
15. Practical Physics, by C L Arora. S. Chand & Company LTD.