Study Scheme & Syllabus of
Bachelor of Technology
(1st and 2nd semester)
Batch 2021 onwards

Chemistry Group

1st Semester

S. No.	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
				L	T	P	Internal	External	
1	Basic Science course	BTAC-21101	Chemistry	3	1	0	40	60	4
2	Basic Science course	BTAM-21101	Mathematics-I	4	1	0	40	60	5
3	Engineering Science Courses	BTCS-21101	Programming for Problem Solving	3	0	0	40	60	3
4	Engineering Science Courses	BTMP-21101	Workshop Manufacturing Practices (Theory and Lab)	1	0	4	60	40	3
5	Humanities and Social Sciences including Management courses	BTHU-21101	English	2	0	0	40	60	2
6	Basic Science course	BTAC-21102	Chemistry Lab	0	0	3	30	20	1.5
7	Humanities and Social Sciences including Management courses	BTHU-21102	English Lab	0	0	2	30	20	1
8	Engineering Science Courses	BTCS-21102	Programming for Problem Solving lab	0	0	4	30	20	2
	Total			13	2	13	310	340	21.5

2nd Semester

S. No	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
1	Basic Science course	BTPH-21101	Physics	4	1	0	40	60	5
2	Basic Science course	BTAM-21102	Engineering Mathematics-II	4	1	0	40	60	5
3	Engineering Science Courses	BTEC-21101	Electrical & Electronics Engineering	3	1	0	40	60	4
4	Engineering Science Courses	BTME-21101	Engineering Graphics	1	0	6	40	60	4
5	Engineering Science Courses	BTME-21102	Engineering Mechanics	3	1	0	40	60	4
6	Basic Science course	BTPH-21102	Physics Lab	0	0	3	30	20	1.5
7	Engineering Science Courses	BTEC-21102	Electrical & Electronics Engineering Lab	0	0	2	30	20	1
	Total			**15**	**4**	**11**	**260**	**340**	**24.5**

Physics Group

1st Semester

S. No	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
				L	T	P	Internal	External	
1	Basic Science course	BTPH-21101	Physics	4	1	0	40	60	5
2	Basic Science course	BTAM-21101	Engineering Mathematics-I	4	1	0	40	60	5
		BTBM-21101	Engineering Mathematics-I (for Bio-Technology students only)						
3	Engineering Science Courses	BTEC-21101	Electrical & Electronics Engineering	3	1	0	40	60	4
4	Engineering Science Courses	BTME-21101	Engineering Graphics	1	0	6	40	60	4
5	Engineering Science Courses	BTME-21102	Engineering Mechanics	3	1	0	40	60	4
6	Basic Science course	BTPH-21102	Physics Lab	0	0	3	30	20	1.5
7	Engineering Science Courses	BTEC-21102	Electrical & Electronics Engineering Lab	0	0	2	30	20	1
	Total			**15**	**4**	**11**	**260**	**340**	**24.5**

2nd Semester

S. No.	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
				L	T	P	Internal	External	
1	Basic Science course	BTAC-21101	Chemistry	3	1	0	40	60	4
2	Basic Science course	BTAM-21102	Mathematics-II	4	1	0	40	60	5
3	Engineering Science Courses	BTCS-21101	Programming for Problem Solving	3	0	0	40	60	3
4	Engineering Science Courses	BTMP-21101	Workshop Manufacturing Practices (Theory and Lab)	1	0	4	60	40	3
5	Humanities and Social Sciences including Management courses	BTHU-21101	English	2	0	0	40	60	2
6	Basic Science course	BTAC-21102	Chemistry Lab	0	0	3	30	20	1.5
7	Humanities and Social Sciences including Management courses	BTHU-21102	English Lab	0	0	2	30	20	1
8	Engineering Science Courses	BTCS-21102	Programming for Problem Solving lab	0	0	4	30	20	2
	Total			**13**	**2**	**13**	**310**	**340**	**21.5**

BTAM-21101, Engineering Mathematics-I
(Common to all B.Tech branches except Biotech)

Internal Marks: 40   **L T P**
External Marks: 60   **4 1 0**
Total Marks: 100

Course Objective:
ōMath and basic science are certainly the foundations of any engineering program. This fact will not change in the foreseeable future,ö said by Ellis et al., Engineering Mathematics is an essential tool for describing and analyzing engineering processes and systems. Mathematics also enables precise representation and communication of knowledge. Core mathematics courses have broader objectives than just supporting engineering programs.

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:
(1) Students should learn fundamental mathematical, concepts and how to apply them.
(2) Students should learn critical thinking, modeling/problem solving and effective uses of technology.
(3) Students should learn how to read mathematics and use it to communicate knowledge. The students are expected to understand the fundamentals of the mathematics to apply while designing technology and creating innovations.

Suggested Readings / 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. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers,New Delhi.
5. B. V. Ramana, Higher Engineering mathematics,Tata Mcgraw Hills, New Delhi

BTBM-21101, Engineering Mathematics-I
B.Tech BioTechnology (For Biology Students)

Internal Marks: 40 **L T P**
External Marks: 60 **4 1 0**
Total Marks: 100

Course Objectives:

1. Explain why mathematical thinking is valuable in daily life.
2. To understand the basic concepts of Mathematics.
3. To have a proper understanding of mathematical applications in engineering problems.

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 BTBM-21101, Engineering Mathematics-I students will be able to

1. Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.
2. Compute limits and derivatives of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic.
3. Determine the continuity and differentiability of a function at a point and on a set.

4. Compute definite and indefinite integrals of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic.
5. Solve systems of linear equations by use of the matrix.
6. Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers.

Suggested Readings/Books:

ÉDifferential Calculus by Shanti Narain.

ÉIntegral Calculus by Shanti Narain.

ÉMathematics by R.D. Sharma , Dhanpat Rai Publications, New Delhi.

BTAM-21102, Engineering Mathematics-II
(Common to all B.Tech branches)

Internal Marks: 40   **L T P**
External Marks: 60   **4 1 0**
Total Marks: 100

Objectives:

  i) To develop logical understanding of the subject.
  ii) To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from engineering fields.
  iii) 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:

1. Students should learn fundamental mathematical concepts and how to apply them.

2. Students should learn critical thinking, modelling/ problem solving and effective uses of technology.

3. Students should learn how to read mathematics and use it to communicate knowledge. The students are expected to understand the fundamentals of the mathematics to apply while designing technology and creating innovations.

Suggested Readings / 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. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi.
6. Pipes, L.A. and Harvill, L.R., Applied Mathematics for Engineers and Physicists, McGraw Hill
7. Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, 1. K. Publisher.
8. Babu Ram, Advance Engineering Mathematics, Pearson Education.
9. Bindra, J. S., Applied Mathematics, Volume-II, Kataria Publications.

BTCS-21101   Programming for Problem Solving

Internal Marks: 40   **L T P**
External Marks: 60   **3   0   0 [3 credits]**
Total Marks: 100

 Unit1: Introduction to Programming   **(4 lectures)**

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

Unit 2*:*   Arithmetic expressions and precedence   **(2 lectures)**
Unit 3:   Conditional Branching and Loops   **(6 lectures)**
Writing and evaluation of conditionals and consequent branching   **(3 lectures)**
Iteration and loops   **(3 lectures)**
Unit 4: Arrays: Arrays (1-D, 2-D), Character arrays and Strings   **(6 lectures)**
Unit 5:   Basic Algorithms   **(6 lectures)**
Searching (Linear Search), Basic Sorting Algorithms (Bubble Sort), Finding roots of Equations.
Unit 6: Function   **(5 lectures)**
Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference
Unit 7:   Recursion: **(4-5 lectures)**
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series.
Unit 8: Structure: Structures, Defining structures and Array of Structures   **(4 lectures)**
Unit 9:   Pointers: Idea of pointers, Defining pointers.   **(2 lectures)**
Unit 10: File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Text Books
(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
  Suggested Reference Books
 (i)   Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI

 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 decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7.   To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

8. To apply programming to solve simple programming problems, namely root finding of function, differentiation of function and simple integration.

BTCS-21102   Programming for Problem Solving Lab

Internal Marks: 30   **L T P**
External Marks: 20   **0   0 4 [2 credits]**
Total Marks: 50

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

Laboratory Outcomes
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.

BTHU-21101 English

Internal Marks: 40   **L T P**
External Marks: 60   **2 0 0 [2 credits]**
Total Marks: 100

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.

Detailed contents
1. Vocabulary Building
1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to formderivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

2. Basic Writing Skills
2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing
3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

4. Nature and Style of sensible Writing
4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion

5. Writing Practices
5.1 Comprehension

5.2 Précis Writing
5.3 Essay Writing

Course Outcomes:

1. Students will be able to understand spoken and written 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.

BTHU-21102 English Lab
(Oral Communication)

Internal Marks: 30   **L T P**
External Marks: 20   **0 0 2 [1 credits]**
Total Marks: 50
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

Suggested Readings:
(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 understand spoken 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.

BTPH-21101 Physics

Internal Marks: 40   **L T P**
External Marks: 60   **4 1 0**
Total Marks: 100

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.   (6)

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.
                                                                                                              (6)

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.   (6)

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.   (6)

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.   (6)

6. **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.
                                                                                                              (6)

Course Outcomes:
1. 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.

2. 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,

3. Understand and explain scientifically the new developments and breakthroughs in engineering and technology.

Suggested Readings / 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. Learning.Materials Science & Engineering, Callister; WD, John Wiley & Sons.
6. Introduction to Electrodynamics, Griffiths; DJ, Prentice Hall.
7. Lasers & Optical engineering, Dass; P, Narosa Publishers.
8. Optical Fibre system, Technology, Design & Applications, Kao; CK, McGraw Hill.
9. Laser Theory & Applications, Thygrajan; K, Ghatak; AK, Mc Millan India Ltd.

BTPH-21102 Physics Lab

Internal Marks: 30   **L T P**

External Marks: 20   **0   0 3**

Total Marks: 50

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 ó Tensional pendulum

Experiment 2: To determine the Moment of Inertia of a Flywheel.

Experiment 3: To determine the Elastic Constants/Youngøs Modulus of a Wire by Searleøs method

Experiment 4: To determine g by Katerøs 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 ó 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 & Geeøs 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: Newtonøs Rings Experiment

Experiment 21: To study laser interference using Michelsonøs 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 versus 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 Malusølaw in polarization.

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

BTEC21101: Basic Electrical & Electronics Engineering

Internal Marks: 40   **L T P**
External Marks: 60   **3 1 0**
Total Marks: 100

Objectives: This course gives a basic knowledge of circuits, electrical machines, transducers & semiconductor devices 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 as the students of all branches have to deal with the applications of Electrical and Electronics Engineering. The students are expected to learn and understand the applications of electric and electronics concepts for laying foundations of today's and tomorrow's technology.

Part A (Electrical Engineering)

1. 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 & Mesh Analysis.

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).
[8]

2. Magnetic Circuits and Transformer

Laws of Electromagnetic Induction, Concept of Self Induced & Mutually Induced EMFs.

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

3. Rotating Electrical Machines

Construction & Principle of operation of 3 phase Induction motor. Classification of 3 Phase Induction Motors & their applications. Introduction to single phase induction motors and their applications.

DC Machines;Construction and Working Principle, Types of DC Motors & their applications. **[8]**

Part B (Electronics Engineering)

4. Transducers

Construction, working & applications of LVDT, Strain Gauge and Thermistor. Introduction to Digital Multimeter. **[5]**

5. Semiconductor Devices

Principle of operation characteristic and application of PN Junction Diode, Zener Diode, Rectifiers, Principle of operation & characteristics of Bipolar Junction Transistor and Field Effect Transistor, Regulated Power Supply. **[7]**

6. 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. **[5]**

Course Outcomes:
1. Analyze the concepts of single phase and three phase circuits.
2. Understand the concepts of transformers for transmission of power and regulation of voltage.
3. Understand the concepts of elctric motors for various indusrtial and other applications.
4. Learn the applications of various transducers for measurement of various quantities.
5. Learn and understand the applications of electronics concepts for laying foundations of today's and tomorrow's technology.

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

5. A course in Electrical & Electronics Measurements & Instrumentation by A.K.Sawhney, Dhanpat Rai & Co.

BTEC21102: Basic Electrical & Electronics Engineering Lab

Internal Marks: 30   **L T P**
External Marks: 20   **0 0 2**
Total Marks: 50

List of Experiments

1. To study the use of multimeter, ammeter, voltmeter and clamp meter.

2. To measure power and power factor in single phase AC Circuit.

3. To verify the voltage and current relations in three phase star & delta connected systems.

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 verify the rating of compact fluorescent lamp (CFL).

7. To obtain the characteristics of a P-N junction diode.

8. To verify the truth table of logic gates.

9. To obtain the characteristics of a transistor under common emitter (CE) configuration.

10. To study various parts of (i)Transformer (ii) DC Motor (iii) 3 Phase Induction Motor

11. To perform open- and short circuit tests on a single phase transformer and find iron loss & Cu loss.

12. To start and reverse the direction of rotation of a DC motor.

13. To start and reverse the direction of rotation of 3 phase Induction motor.

14. To measure primary and secondary voltages and currents of a loaded and unloaded transformer.

BTME-21101 Engineering Graphics

Internal Marks: 40	**L T P**
External Marks: 60	**1 0 6**
Total Marks: 100	

Course Objective:

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)

9. Computer Aided Drafting
General instructions related to drafting software, Exercise based upon simple entities like lines, circle, arc, polygon, ellipse etc. Exercise based upon commands like polyline, spline, ray, reference line etc, Exercise based upon modifying commands like extend, trim, scale, copy, move etc. Exercise based upon modifying commands like hatching, fillet, chamfer, array etc. Exercise based upon dimensioning in 2D entities and layers. Exercise based upon 3D standard entities such as cube, cylinder, cone etc. Exercise based upon extrude, revolve, union and subtraction to generate simple 3D objects like Bush, V- Block etc. Exercise based upon sectioning and solids. Conversion of 2D drawings into 3D drawings and further modification of drawings.   (15)

Course Outcomes:
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.
5. Apply modern engineering graphics software tools necessary for engineering practice.

Suggested Books
1. Gill P S, õEngineering Graphics and Draftingö, Katria and Sons, Delhi.
2. Bhat N D, õElementary Engineering Drawing-Plane and solid Geometryö, Chartotar Publishing House, Anand.
3. John K C, õEngineering Graphics for Degreeö, PHI Learning Private Limited, New Delhi. 4. Johle D A, õEngineering Drawingö, Tata McGraw Hill Education Private Limited, New Delhi.
5. Agrawal B, Agrawal C M, õEngineering Drawingö, Tata McGraw Hill Publishing Company Limited, New Delhi.

BTME-21102 Engineering Mechanics

Internal Marks: 40	**L T P**
External Marks: 60	**3 1 0**
Total Marks: 100	

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, DøAlembertøs Principle in plane motion, Instantaneous centre of rotation in plane motion and simple problems.   (6)

Course Outcomes:
6. Understand the meaning of Engineering Mechanics.
7. Solve the Problem related to the behavior of a rigid body due to an external load.
8. Solve, analyze and design moment of inertia of plain figures.
9. Analyze the mass moment of solid objects.
10. Apply the Work-Energy equation and impulse-Momentum equation.
11. 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 ó Irving H. Shames, PHI Publications
4. Engineering Mechanics ó 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

BTAC-21101 Chemistry

Internal Marks: 40   **L T P**
External Marks: 60   **3 1 0**
Total Marks: 100

Objectives

Concepts of quantum chemistry, bonding, stereochemistry, and those of Synthesis methodologies and reactivity of organic compounds.

1. **Introduction to quantum theory for chemical systems:**   (6 lectures)

Schrodinger equation, Applications to Hydrogen atom, Atomic orbitals, many electron atoms.

2. **Chemical bonding in molecules:**   (12 lectures)

MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

3. **Introduction to Stereochemistry:**   (6 lectures)

Stereodescriptors ó R, S, E, Z. Enantiomers and Diastereomers. Racemates and their resolution. Conformations of cyclic and acyclic systems.

4. **Reactivity of organic molecules:**   (9 lectures)

 Factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. Thermodynamic control of reactions.

5. **Strategies for synthesis of organic compounds:**   (12 lectures)

 Reactive intermediates substitution, elimination, rearrangement, kinetic and thermodynamic aspects, role of solvents.

Suggested Text Books

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

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

3..Essentials of Physical Chemistry, Bahl & Tuli, S.Chand Publishing

4. Applied Chemistry, Sunita Rattan, Kataria

5. Engineering Chemistry, Baskar, Wiley

6. Engineering Chemistry ó I, D. Gourkrishna, Vikas Publishing

7. Advanced Organic Chemistry, Dr. Jagdamba Singh & Dr. L.D.S. Yadav, Pragati Prakashan.

8. University Chemistry, by B. H. Mahan

BTAC-21102 Chemistry Lab

Internal Marks: 30   **L T P**
External Marks: 20   **0 0 3**
Total Marks: 50

Choice of 10-12 experiments from the following

♣ Determination of surface tension and viscosity

♣ Thin Layer Chromatography

♣ Ion exchange column for removal of hardness of water

 ♣ Colligative properties using freezing point depression

♣ Determination of the rate constant of a reaction

♣ Determination of cell constant and conductance of solutions

♣ Potentiometry-determination of redox potentials and emf

♣ Synthesis of a polymer/drug

♣ Saponification/acid value of an oil

♣ Chemical analysis of a salt

♣ Lattice structures and packing of spheres

♣ Models of potential energy surfaces

♣ Chemical oscillations- Iodine clock reaction

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

♣ Adsorption of acetic acid by charcoal

♣ 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.

Laboratory 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:

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

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

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

BTMP-21101 Workshop Manufacturing Practices (Theory and Lab)

Internal Marks: 60   **L T P**
External Marks: 40   **1 0 4**
Total Marks: 100

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

12. Understand the Various manufacturing Processes.
13. Classify the manufacturing processes commonly employed in industry.
14. Fabricate small components using different manufacturing processes.
15. 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