Revised Structure B. Tech 1st Year
B.Tech. I Semester
(Biotechnology)

S. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS101T	Engineering Physics	3	1	0	30	20	50		100		150	4
2	KBT101T/ KBT102T/	Elementary Mathematics –I/ Remedial Biology-I	3	1	0	30	20	50		100		150	4
3	KEE101T	Basic Electrical Engineering	3	0	0	30	20	50		100		150	3
4	KCS101T	Programming for Problem Solving	3	0	0	30	20	50		100		150	3
5	KAS151P	Engineering Physics Lab	0	0	2				25		25	50	1
6	KEE151P	Basic Electrical Engineering Lab	0	0	2				25		25	50	1
7	KCS151P	Programming for Problem Solving	0	1	2				25		25	50	1
8	KCE151P	Engineering Graphics & Design Lab	0	1	2				50		50	100	1
9	KMC101	AI For Engineering	2	0	0	15	10	25		25		50	2
10	**KNC101**	**Soft Skill I**	2	0	0	15	10	25		25			NC
11	MOOCs	(For B.Tech. Hons. Degree)*											
		Total										900	20

B.Tech 1st Year
I Semester
Syllabus

Revised Structure B. Tech 1st Year

KAS-101T KAS-201T	ENGINEERING PHYSICS	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	**Relativistic Mechanics:** Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson- Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein"s mass energy relation, Relativistic relation between energy and momentum, Massless particle.	8
II	**Electromagnetic Field Theory:** Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell"s equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.	8
III	**Quantum Mechanics:** Black body radiation, Stefan"s law, Wien"s law, Rayleigh-Jeans law and Planck"s law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.	8
IV	**Wave Optics:** Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh"s criterion of resolution, Resolving power of grating.	8
V	**Fibre Optics & Laser:** Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres. Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein"s coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.	8

Reference Books:

1. Concepts of Modern Physics – Aurthur Beiser (McGraw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics – Brijlal & Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Course Outcomes: At the end of this course students will demonstrate the ability to:
1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Revised Structure B. Tech 1st Year

KAS-102T KAS-202T	ENGINEERRING CHEMISTRY	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	**Atomic and Molecular Structure:** Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nano-materials and its application.	8
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	8
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	8
IV	**Water Analysis;** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulong's methods).	8
V	**Polymer;** Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organo metallic compounds (Grignard reagent) and their applications.	8

Text Books:
1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry By Fre W., Billmeyer
7. Engineering Chemistry By Satya Prakash

Course Outcomes: At the end of this course students will demonstrate the ability to
1. Use of different analytical instruments.
2. Measure molecular/ system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

B. TECH. FIRST YEAR COURSE
(B. Tech. Bio-Technology Engineering)
(Effective from the Session: 2020-21)

Subject Code	KBT 101T					
Category	Basic Science Course					
Subject Name	Elementary Mathematics – I					
Scheme and Credits	**L-T-P**	**Theory Marks**	**Sessional**		**Total**	**Credit**
			Test	**Assig/Att.**		
	3—1—0	100	30	20	150	4
Pre- requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or equivalent Board.					

Course Outcomes:

The objective of this course is to familiarize the biotechnological engineers with techniques of Algebra, permutation and combinations, coordinate geometry, calculus and Differentiability and its applications in real world. It aims to equip the students with standard concepts and tools from intermediate to advanced level that will enable them to tackle more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

- The effective mathematical tools of Algebra to solve the linear inequalities.
- The tools of permutation and combinations and its applications. Also concepts of sequence and Series are introduced.
- To apply concepts of coordinate geometry in engineering mathematics.
- The elementary concept of calculus using limits and derivatives.
- To deal with continuous and differentiable functions to identify the rate of change and its applications in real life Situations.

Elementary Mathematics - I

All India Council for Technical Education Mathematics Course (Bio-Technology)

Elementary Mathematics - I - 3L 1T 0P

UNIT	Topic	Lectures
1	**Algebra:** Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system. Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables-graphically	8
II	**Permutations & Combinations:** Fundamental principle of counting. Factorial n(n!).Permutations and combinations, derivation of formulae and their connections, simple applications. Sequence and Series: Arithmetic progression (A. P.). arithmetic mean (A.M.) Geometric progression (G.P.), general term of a G.P., sum of n terms of a G.P., geometric mean (G.M.), relation between A.M. and G.M. Sum to n terms of the special series n, n^2 and n^3.	8

III	**Coordinate Geometry:** Straight Lines: Brief recall of 2D from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two point form, intercepts form and normal form. General equation of a line. Distance of a point from a line. Conic Sections: Sections of a cone: circle, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle. Introduction to Three -dimensional Geometry Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.	8
IV	**Calculus:** Limits and Derivatives: Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.	8
V	**Continuity and Differentiability:** Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions and their derivative. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations. Applications of Derivatives: rate of change, increasing/decreasing functions, tangents & normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).	8

Text Books:-

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.
3. Mathematics - Textbook for Class XI, NCERT Publication
4. Mathematics Part I - Textbook for Class XII, NCERT Publication
5. Mathematics Part II - Textbook for Class XII, NCERT Publication

Reference Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
3. Advanced Modern Engineering Mathematics by Glyn james, Pearson Education
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. Charles E Roberts Jr, Ordinary Differential Equations, Application, Model and Computing, CRC Press T&F Group.

COURSE OUTCOMES

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of this course, the students will be able to:		
CO 1	Understand the concept of algebra for finding the solution of quadratic equation in complex system, algebraic solution of linear inequalities in one variable and create graphical solution of linear inequalities in two variables	K_2 ,K_5 & K_6
CO 2	Understand the concept of permutation and Combination to create the formulation and their connection and apply for evaluating sum and means of AP and GP and some special series	K_2, K_3 & K_6
CO 3	Remember the concept of two and three dimensional geometry to apply to find conic section (circle, ellipse, parabola, hyperbola) and to evaluate coordinate plane and distance between two points	K_1,K_3 & K_5
CO 4	Apply the concept of derivative to evaluate and analyze rate of change, slope , derivative of polynomial and trigonometric function	K_3& K_4
CO 5	Remember the concept of derivative to evaluate derivative of composite function, inverse trigonometric function, implicit, composite and exponential functions and apply in Rolle's and Lagranges'theorems and their application	K_1, K_3 & K_5

K_1 – Remember, K_2 – Understand, K_3 – Apply, K_4 – Analyze, K_5 – Evaluate, K_6 – Create

Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:
   a. Class attendance and participation in class discussions etc.
   b. Quiz.
   c. Tutorials and assignments.
   d. Sessional examination.
   e. Final examination.

Award of Internal/External Marks:

Assessment procedure will be as follows:
   1. These will be comprehensive examinations held on-campus (Sessionals).
   2. Quiz.
     a. Quiz will be of type multiple choice, fill-in-the-blanks or match the columns.
     b. Quiz will be held periodically.
   3. Tutorials and Assignments
     a. The assignments/home-work may be of multiple choice type or comprehensive type at least one assignment from each Module/Unit.
     b. The grades and detailed solutions of assignments (of both types) will be accessible after the submission deadline.
   4. Final examinations.
     These will be comprehensive external examinations held on-campus or off campus (External examination) on dates fixed by the Dr. APJ Abdul Kalam Technical University, Lucknow.

Revised Structure B. Tech 1st Year

KBT 102T	REMEDIAL BIOLOGY I	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	The cell concept, structure of prokaryotic, eukaryotic cells, plant cells and animal cells, Structure and function of cell membrane, cell organelles and their function. Structure and use of compound microscope, Macro and micro molecules, Basic chemical constituents of living body	8
II	Tissues in animal and plants, Morphology, anatomy and functions of different parts of plants: Root, stem, leaf, inflorescence, flower, fruit and seed, Concepts of botanical garden, herbaria, zoological park and museums.	8
III	Classification of living organisms (Five kingdom classification, major groups and principles of classification in each kingdom), Systematic and binomial system of nomenclature, Concept of animal and plant classification.	8
IV	Concepts of alleles and genes, Mendelian Experiments, Cell cycle (Elementary Idea), mitosis and meiosis, techniques to study mitosis and meiosis.	8
V	Plant Physiology: Concepts of diffusion, osmosis, imbibitions, Movement of water, food, nutrients and gases, Photosynthesis, plant growth and development.	8

Text Books:-
1. Biology-Textbook of Class XI, NCERT Publication
2. Biology-Textbook of Class XII, NCERT Publication

Reference Books:-
1. Biology by Peter H Raven, George b Johnson, Kenneth A., Mason, Jonathan Losos, Susan Singer (McGraw Hill Publication)

Course Outcomes: At the end of this course students will demonstrate the ability to:

	Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of this course, the students will be able to:		
CO 1	To understand the basics of living systems.	K_2 & K_3
CO 2	To understand key common features of living organisms & its function	K_1, K_3 & K_5
CO 3	To know the anatomy and functions of cells	K_2 & K_5
CO 4	To know the concepts of alleles and genes.	K_3
CO 5	To understand the plant physiology	K_3 & K_5

Subject Code	**KBT 201T**					
Category	Basic Science Course					
Subject Name	Elementary Mathematics-II					
Scheme and Credits	**L-T-P**	**Theory Marks**	**Sessional**		**Total**	**Credit**
			Test	**Assig/Att.**		
	3—1—0	100	30	20	150	4
Pre-requisites (if any)	Knowledge of Intermediate Mathematics of UP Board or Equivalent Board as well as RBT 103.					

Course Outcomes:

The objective of this course is to familiarize the Bio-Technological engineers with techniques in multivariate integrals, linear Differential Equations, vector calculus, three – dimensional geometry and probability. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

- The basic concepts of Integration to deal with real world problems.
- The tool of linear differential equations that are used in engineering problems.
- To deal with vector calculus that is required in Bio-technology engineers.
- To apply the concepts of three dimensional geometry in engineering.
- The concepts of probability in comprehensive manner.

Elementary Mathematics-II

All India Council for Technical Education Mathematics Course (Bio-Technology)

Elementary Mathematics - II - 3L 1T 0P

UNIT	Topic	Lectures
1	**Integrals:** Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated. Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals. Applications of the Integrals: Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).	8
II	**Differential Equations:** Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type: $\frac{dy}{dx} + py = q$, where p and q are functions of x.	8

III	**Vectors:** Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.	8
IV	**Three- Dimensional Geometry:** Direction cosines/ ratios of a line joining two points. Cartesian equation of a line, coplanar lines, shortest distance between two lines. Cartesian equation of a plane, Angle between (a) two lines (b) two planes and (c) a line and a plane. Distance of a point from a plane.	8
V	**Probability:** Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events. Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution.	8

Text Books:-

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher.
2. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing –House.
3. Mathematics - Textbook for Class XI, NCERT Publication
4. Mathematics Part I - Textbook for Class XII, NCERT Publication
5. Mathematics Part II - Textbook for Class XII, NCERT Publication

Reference Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd.
2. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons.
3. Advanced Modern Engineering Mathematics by Glyn james, Pearson Education.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson.
5. Charles E Roberts Jr, Ordinary Differential Equations, Application, Model and Computing, CRC Press T&F Group.

	Course Outcomes (CO)	**Bloom'Knowledge Level (KL)**
	At the end of this course the students will be able to:	
CO1	Apply the concept of integral for finding areas of circles/parabolas/ellipses and area between these curves	K_3 , K_5
CO2	Remember the concept of differential equation for finding solution of different types of differential equations	K_1, K_5
CO3	Understand the concept of vectors to evaluate directional derivatives, and create projection of a vector of a line	K_2, K_5,K_6
CO4	Remember the concept of three dimensional geometry to apply for finding Cartesian equation of a line, shortest distance, angle between two lines, shortest distance, distance of a point from a plane	K_1, K_3
CO5	Remember the concept of probability to evaluate the probability in different situation, probability distribution and analyse their properties	K_1 , K_4, K_5

K_1 – Remember, K_2 – Understand, K_3 – Apply, K_4 – Analyze, K_5 – Evaluate, K_6 – Create

Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:
a. Class attendance and participation in class discussions etc.
b. Quiz.
c. Tutorials and assignments.
d. Sessional examination.
e. Final examination.

Award of Internal/External Marks:

Assessment procedure will be as follows:
1. These will be comprehensive examinations held on-campus (Sessionals)
2. Quiz
    a. Quiz will be of type multiple choice, fill-in-the-blanks or match the columns.
    b. Quiz will be held periodically
3. Tutorials and Assignments
    a. The assignments/home-works may be of multiple choice type or comprehensive type at least one assignment from each Module/Unit.
    b. The grades and detailed solutions of assignments (of both types) will be accessible online after the submission deadline.
4. Final examinations.
    a. These will be comprehensive external examinations held on-campus or off campus (External examination) on dates fixed by the Dr. APJ Abdul Kalam Technical University, Lucknow.

KBT 202T	REMEDIAL BIOLOGY **II**	3L:1T:0P	**4 Credits**

Unit	Topics	Lectures
I	Brief history of microbiology, Types of microorganisms, Basic idea of domain bacteria, proteobacteria, non proteobacteria Gram –ve and Gram +ve bacteria, lichens, algae, protozoa, helminthes, viral structures, viral multiplication, Role of microorganisms in the production of industrial chemicals and pharmaceuticals.	8
II	Functional Anatomy of Prokaryotic and Eukaryotic Cells: Size, shape, and arrangement of bacterial cells. Structure and function of cells.	8
III	Catabolic & anabolic reactions: enzymes, energy production and carbohydrate metabolism. Lipid & protein catabolism, Energy production mechanism, metabolic diversity & pathways of energy use. Integration of metabolism.	8
IV	Energy Utilization: Structure of mitochondria, cellular respiration, relationship of carbohydrate metabolism to other compounds, Glycolysis, formation of acetyl co-A, Kreb cycle, Electron Transport System and Oxidative Phosphorylation, ATP, factors affecting respiration.	8
V	Reproductive health and human welfare: Population and birth control, sexually transmitted diseases, infertility, Cancer and AIDS, Basic concepts of immunology, vaccines.	8

Text Books:-
1. Biology-Textbook of Class XI, NCERT Publication
2. Biology-Textbook of Class XII, NCERT Publication
3. Microbiology- Pelzar, Mcgraw- Hill Publishing Com. Ltd., 2002
4. An introduction to immunology by C.V. Rao, Narosa publishing house

Reference Books:-
1. Biology by Peter H Raven, George b Johnson, Kenneth A., Mason, Jonathan Losos, Susan Singer (McGraw Hill Publication)
2. General Microbiology: Stainier, Adelberq and Ingraham

Course Outcomes: At the end of this course students will demonstrate the ability to:

	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of this course, the students will be able to:		
CO 1	To know the basic idea of Microbiology.	K_2 & K_3
CO 2	To Understand the functional Anatomy of Cells	K_1, K_3 & K_5
CO 3	To know the energy production mechanism	K_2 & K_5
CO 4	To understand the energy utilization.	K_3
CO 5	Reproductive health and human welfare	K_3 & K_5

Revised Structure B. Tech 1st Year

KAS-151P KAS-251P	PHYSICS LAB	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:
Group A

1. To determine the wavelength of sodium light by Newton"s ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel"s bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan"s law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistanceusing Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

List of Experiments: Any ten experiments (at least four from each group) with virtual link

	Group A	Virtual Lab Link	Alternate Lab Link
1	To determine the wavelength of sodium light by Newton's ring experiment.	https://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/engg_physics/labs/exp1/simulation/simulator4.html?medium=1
2	To determine the wavelength of different spectral lines of mercury light using plane transmission grating.	http://vlab.amrita.edu/?sub=1&brch=281&sim=334&cnt=1	
3	To determine the specific rotation of cane sugar solution using polarimeter	_	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/cane-sugar-rotation-iitk/simulation.html
4	To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/focal-length-measurement-

	focal length of combination of lenses.		iitk/simulation.html
5	To measure attenuation in an optical fiber.	http://vlab.amrita.edu/index.php?sub=59&brch=269&sim=1369&cnt=2873	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/numerical-aperture-measurement-iitk/simulation.html
6	To determine the wavelength of He-Ne laser light using single slit diffraction.	http://vlab.amrita.edu/index.php/index.php?sub=1&brch=189&sim=334&cnt=1	https://youtu.be/0qIN2qHCvvs (Laser diffraction grating)
7	To study the polarization of light using He-Ne laser light.		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/he-ne-laser-polarization-iitk/simulation.html
8	To determine the wavelength of sodium light with the help of Fresnel's bi-prism	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/fresnel-biprism-iitk/simulation.html	-
9	To determine the coefficient of viscosity of a given liquid.	https://amrita.olabs.edu.in/?sub=1&brch=5&sim=225&cnt=2	
10	To determine the value of acceleration due to gravity (g) using compound pendulum.	http://vlab.amrita.edu/?sub=1&brch=280&sim=210&cnt=2	
	Group B		
1	To determine the energy band gap of a given semiconductor material.	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/energy-band-gap-iitk/simulation.html	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/energy-band-gap-iitk/simulation.html
2	To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.	https://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1	https://youtu.be/lUugrqMOY7E (Hall Effect)
3	To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.	http://vlab.amrita.edu/?sub=1&brch=192&sim=972&cnt=1	https://youtu.be/v2B0QyW8XJ0 (Variation of Magnetic Field along the axis of circular coil carrying current)
4	To verify Stefan's law by electric method..	http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/vlabs_recbanda/labs/exp1/index.html	https://youtu.be/qyFQ31s-bAw(Stefans law verification)
5	To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.	https://vlab.amrita.edu/?sub=1&brch=192&sim=346&cnt=1	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/carey-foster-bridge-iitk/simulation.html
6	To study the resonance condition of a series LCR circuit.	https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1	
7	To determine the electrochemical equivalent (ECE) of copper.	http://learnphysics-dhruv.blogspot.com/2015/03/copper-voltameter-to-determine-electro.html	https://youtu.be/drV2nbDjR1k (ECE of Copper experiment)
8	To calibrate the given ammeter and voltmeter by potentiometer.		
9	To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.	-	
10	To measure high resistance by leakage method	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/carey-foster-bridge-iitk/simulation.html	

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar & Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton"s ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel"s bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Revised Structure B. Tech 1st Year

KAS-152P KAS-252P	CHEMISTRY LAB	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.

2. Determination of temporary and permanent hardness in water sample using EDTA.

3. Determination of iron content in the given solution by Mohr's method.

4. Determination of viscosity of given liquid.

5. Determination of surface tension of given liquid.

6. Determination of chloride content in water sample.

7. Determination of available chlorine in bleaching powder.

8. Determination of pH by pH-metric titration.

9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.

10. Determination of Cell constant and conductance of a solution.

11. Determination of rate constant of hydrolysis of esters.

12. Verification of Beer's law.

List of Experiments: Any ten experiments with virtual link

SN	Lab Practical	Virtual Lab Link
1	Determination of alkalinity in the given water sample.	https://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=1
2	Determination of temporary and permanent hardness in water sample using EDTA.	http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Environmental_Engineering_1/labs/determination-of-hardness-nitk/simulation.html
3	Determination of iron content in the given solution by Mohr's method.	https://vlab.amrita.edu/?sub=2&brch=193&sim=352&cnt=1
4	Determination of viscosity of given liquid.	http://vlab.amrita.edu/?sub=3&brch=190&sim=339&cnt=1
5	Determination of surface tension of given liquid.	https://amrita.olabs.edu.in/?sub=1&brch=5&sim=224&cnt=7
6	Determination of chloride content in water sample.	http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Environmental_Engineering_1/labs/determination-of-hardness-nitk/index.html

7	Determination of available chlorine in bleaching powder.	E bootathon 04
8	Determination of pH by pH-metric titration.	https://vlab.amrita.edu/?sub=2&brch=193&sim=352&cnt=1
9	Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.	E bootathon 01.
10	Determination of Cell constant and conductance of a solution.	http://vlab.amrita.edu/?sub=3&brch=193&sim=575&cnt=1
11	Determination of rate constant of hydrolysis of esters.	E bootathon 04
12	Verification of Beer's law.	http://vlab.amrita.edu/?sub=3&brch=206&sim=569&cnt=975

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity,
3. Measure conductance of solution, chloride and iron content in water, hardness of water.
4. Estimate the rate constant of reaction.