

**F. Y. B. Sc. (2016-17)**  
**Physical & Inorganic Chemistry (CH-1),**  
**First Term**

**Topic:-**

1. States of Matter
2. Surface Chemistry
3. Chemical Mathematics
4. Mole Concept, Stoichiometric and Numerical, Oxidation- reduction

***Aims and objectives:***

Students should know –

1. This topic makes understanding of behavior of gases, ideal gas as a model system and its extension to real gases.
2. Theoretical basis of adsorption phenomena is integrated.
3. Types of adsorption, adsorption isotherms, Freundlich isotherm, Langmuir isotherm, adsorption of gases on solids. Phenomena of catalysis, Definition and classification, emulsions, gels and sols.
4. Variables as function, variables used in chemistry Rules of differentiation, Rules of integration, Plotting graphs.
5. Mole concept-Determination of mol. Weight by gram molecular volume relationship, problems based on mole concept. Definitions to related terms like oxidation, reduction, oxidizing agent, reducing agent, oxidation number, Balancing of redox reactions.

**Outcomes:-**

1. Student understanding dynamic nature of surface and its applications in catalysis and in dispersed phases will lead to new area of nanoscience.
2. Student understood to solve problems regarding van der Waal's and Critical constant and regarding P-V-T relation.
3. Student applications of adsorption, types of catalysis-homogeneous and heterogeneous catalyst.
4. Student Understanding dynamic nature of surface and its applications.
5. Student solves the mathematical problems.
6. Solve problems based on GMV relationship. Balancing redox reaction.

**F. Y. B. Sc. (2016-17)**  
**Physical & Inorganic Chemistry (CH-1),**  
**Term - II**

**Topic:-**

1. Atomic Structure
2. Chemical Thermodynamics
3. Chemical Bonding

***Aims and objectives:***

**Students should know**

1. This topic makes understanding atomic spectrum of hydrogen, Bohr model of hydrogen atom-derivation of atomic radius and energy, energy level diagram of hydrogen atom .
2. Natural changes are understood with the help of second and third laws of thermodynamics. These laws are presented with the help of state function entropy.
3. Attainment of stable configuration, Types of bonds ionic, covalent, coordinate & metallic, Types of overlaps: s-s, p-p, s-p, p-d, d-d and their examples, Formation of sigma & pi bonds.
4. Theories of bonding- a) valence bond theory, b) Heitler London theory and c) Pauling Slater theory, Concept of hybridization.

**Outcomes:-**

1. Student understanding de Broglie's hypothesis, Heisenberg's uncertainty principle (without proof), wave equation, time independent Schrödinger equation.
2. Entropy changes in various processes and under various conditions discussed.
3. Need of hybridization, steps involved in hybridization, explanation of covalency of atoms in the moles based on hybridization.
4. Assumptions, need of theory, application of theory to explain geometry of irregular molecules.

**Physics-I**  
**F. Y. B. Sc. (2014-15)**  
**Mechanics, Heat and Thermodynamics**

**Aims And Objectives:**

1. To provide in depth knowledge of scientific and technological aspects of Physics
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hand on activities, study visits, projects etc.
4. To train students in skills related to research, education, industry, and market.
5. To create foundation for research and development in Electronics
6. To develop analytical abilities towards real world problems
7. To help students build-up a progressive and successful career in Physics

**Outcomes:**

On successful completion of this course students will be able to do the following:

1. Demonstrate an understanding of Newton's laws and applying them in calculations of the motion of simple systems.
2. Use the free body diagrams to analyse the forces on the object.
3. Understand the concepts of energy, work, power, the concepts of conservation of energy and be able to perform calculations using them.
4. Understand the concepts of elasticity and be able to perform calculations using them.
5. Understand the concepts of surface tension and viscosity and be able to perform calculations using them.
6. Use of Bernoulli's theorem in real life problems.
7. Demonstrate quantitative problem solving skills in all the topics covered.

**Physics Paper II:**  
**F.Y.B.Sc.(2014-15)**  
**Physics Principles Application And Electromagnetics**

**Aims And Objectives:**

1. To provide in depth knowledge of scientific and technological aspects of Physics
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hand on activities, study visits, projects etc.
4. To train students in skills related to research, education, industry, and market.
5. To create foundation for research and development in Electronics
6. To develop analytical abilities towards real world problems
7. To help students build-up a progressive and successful career in Physics

**Outcomes:**

On successful completion of this course students will be able to do the following:

1. To demonstrate an understanding of electromagnetic waves and its spectrum.
2. Understand the types and sources of electromagnetic waves and applications.
3. To understand the general structure of atom, spectrum of hydrogen atom.
4. To understand the atomic excitation and LASER principles.
5. To understand the bonding mechanism in molecules and rotational and vibrational energy levels of diatomic molecules.
6. To demonstrate quantitative problem solving skills in all the topics covered.

Mathematics  
F. Y. B. Sc 2014-15  
Paper I  
Algebra and Geometry

Aims

- i) Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of innumerable power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.
- ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.
- iii) Enhancing students overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

Objective

- (i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- (ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- (iii) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
- (iv) A student be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- (v) A student should be made aware of history of mathematics and hence of its

Outcomes

- (i) Compare and contrast the geometries of the Euclidean and hyperbolic planes,
- (ii) Analyze axioms for the Euclidean and hyperbolic planes and their consequences,
- (iii) Use transformational and axiomatic techniques to prove theorems,
- (iv) Analyze the different consequences and meanings of parallelism on the Euclidean and hyperbolic planes

Mathematics  
F. Y. B. Sc 2014-15  
Paper II  
Calculus and Diff Equation

**Aims**

- i) Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of innumerable power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.
- ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.
- iii) Enhancing students overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

**Objective**

- (i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- (ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- (iii) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
- (iv) A student be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- (v) A student should be made aware of history of mathematics and hence of its

**Outcomes**

- (I) Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions,
- (ii) Produce and interpret graphs of basic functions of these types,
- (iii) Solve equations and inequalities, both algebraically and graphically, and
- (iv) Solving and model applied problems.

## Class-F.Y.B.Sc. Semester-I and II

### Subject Name : Industrial Botany

course code: BO 112

#### Topic

Sem I	Sem II
1.Introduction to industrial botany	1.biofuel Industry
2.Floriculture industry	2.bio-pesticide industry
3.Plant Nursery Industry	3.Industrial Mycology
4.Plant Tissue culture industry	4.Biofertilizer Industry
5.Agree Industries	5.Fruit processing industry
6.Musroom industry	6.Plant pharmaceutical industry

#### Aim and Objective

1. To make the students aware of applications of different plants in various industries
2. To highlight the potential of these studies to become an entrepreneur
3. To equip the students with skills related to laboratory as well as field based studies
4. To make the students aware about conservation and sustainable use of plants
5. To facilitate students for taking up and shaping a successful career in Botany
6. To address the socio-economical challenges related to plant sciences

#### Outcomes

1. Students understood applications of plants in various industries.
2. Students developed the industrial approach.
3. Student understood the methods and value of conservation of plants.

## **Class-F.Y.B.Sc. Semester-I and II**

### **Subject Name: Fundamentals of Botany plant diversity**

#### **Topic:-**

<b>Sem-I</b>	<b>Sem-II(Morphology &amp; Anatomy)</b>
1. Introduction	1. Morphology
2. Algae	2. Morphology of veg. Parts
3. Fungi	3. Morphology of reproductive parts
4. Lichen	4. Anatomy
5. Bryophyte	5. Types of tissue
6. Pteridophyte	6. Internal organisation of primary plant body.
7. Gymnosperm	
8. Angiosperm	

#### **Aim and Objective**

1. To provide through knowledge about various plant group from primitive to highly evolved.
2. To make the students aware of application of different plants in various industries
3. To highlight the potential of these. Studies to become an entrepreneur.
4. To equip the students with skills related to laboratory as well as field base studies.
5. To make the student aware about conservation & sustainable use of plants.
6. To create foundation for further studies in botany.
7. To address the socio-economical challenges related to plant sciences.
8. To facilitate students for taking up & shaping a successful carrier in botany.

#### **Outcomes-**

At F.Y.B.Sc. the topics related to the fundamentals of botany including exposure to diversity in plant groups & industries related to plant sciences are covered.

The practical course is aimed to equip the students with skills required for plant identification, description, classification & also application of these plants in various industries.

**S. Y. B. Sc.**  
**Physical & Analytical Chemistry (CH-211)**  
**Sem-I**

**Topic:-**

1. Elementary Chemical Kinetics.
2. Photochemistry.
3. Distribution law
4. Introduction to Analytical Chemistry.
5. Errors in Quantitative Analysis.
6. Inorganic Qualitative Analysis
7. Analysis of Organic Compounds (Qualitative & Quantitative)

***Aims and objectives:***

**Students should know**

1. Student should learn Concept of kinetics, terms used , rate laws , types of order ,Discuss examples of first order and second order reaction, Pseudo molecular reactions, Factors affecting on rate of reaction.
2. After studying the chapter student should be able to , Know about photochemistry, Understand difference between thermal and photochemical reactions, Understand laws of photochemistry, Learn what is quantum yield and it's measurement.
3. Concept of distribution of solute amongst pair of immiscible solvents. Distribution law and it's thermodynamic proof. Distribution law and nature of solute in solution state. Application of Solvent extraction.
4. Students should learn Chemical analysis and its applications, sampling.
5. Students should learn Meaning of error and terms related to expression & estimation of errors. Methods of expressing accuracy and precision.
6. A student should know Basic principles in qualitative analysis, . Meaning of common ion effect.
7. A student should know Classification of compounds with different functional groups.

**Outcomes:-**

1. Student introduce concept of kinetics at undergraduate level.
2. Student gives impart basic knowledge of photochemistry and its applications.
3. Student understand Nernst Distribution Law and its applications.
4. Student understands errors and its interpretation.
5. student gives the theory underlying Inorganic Qualitative analysis.
6. Student disseminates knowledge of qualitative & quantitative analysis of organic compounds.

**S. Y. B. Sc. (2016-17)**  
**Organic & Inorganic Chemistry (CH-222)**  
**Second Term, Semester II**

**Topic:-**

1. Reagents in Organic Synthesis
2. Chemistry of heterocyclic compounds with one hetero atom
3. Introduction of Bio-molecules
4. Chemistry of d-block elements
5. Organometallic Chemistry
6. Acids, Bases and Solvents
7. Chemical Toxicology

***Aims and objectives:***

Students should know –

1. Concept of different reagents used in the one type of conversion
2. Write and complete various reactions of heterocyclic compounds.
3. Classification of proteins.
4. Predict products.
5. To know position of d-block elements in periodic table.
6. To understand M-C bond and to define organometallic compounds

**Outcomes:-**

1. Students understood about the Use of different hydrogen donors for hydrogenation
2. Student understood about the Use Huckel rule to predict aromaticity.
3. Student understood the importance of biochemistry.
4. Students understood that methods of synthesis of binary metal carbonyls.
5. Students understood some useful solvents.

## **Class-SYBSC Semester-II**

**Subject Name : Plant Biotechnology**

**course code: BO 222**

### **Topic**

1. Introduction to Plant Biotechnology
2. Enzyme technology
3. Fermentation technology
4. Single cell proteins
5. Environmental Biotechnology
6. Basics of plant genetic engineering
7. Methods of gene transfer in plants
8. Applications of plant genetic engineering in crop improvement
9. Nano-biotechnology

### **Aim and Objective**

1. To learn and understand the fundamental scientific concepts relating to a broad range of topics in plant biotechnology
2. To develop practical skills and techniques of student about plants biotechnology
3. To introduce student the principles of plant biotechnology
4. Have an enhanced knowledge and appreciation of biotechnology in agriculture.

### **Outcomes**

1. Students gets familiar with different techniques used in plant biotechnology.
2. Students understood the production of enzymes and single cell protein.
3. Students understood the methods of gene transfer in plants.
4. Students understood the process of production of stress resistant varieties in plant
5. Students understood the awareness of ethical issues and regulatory consideration while addressing social needs for sustainability

## **Class-S.Y.B.Sc. Semester-I and II**

**Subject Name: Taxonomy of Angiosperm & Plant community (Sem-I)**

**Anatomy & Embryology (Sem-II)**

### **Topic:-**

<b>Sem-I</b>	<b>Sem-II</b>
1. Introduction of plant taxonomy	1. Introduction
2. System of classification	2. Epidermal tissue system
3. Taxonomic Literature	3. Mechanical tissue system
4. Source of data for systematics	4. Vascular tissue system
5. Botanical Nomenclature	5. Normal Sec growth
6. Study of plant families	6. Anamolous Sec. growth
7. Computer in Taxonomy	7. Introduction
8. Introduction to Ecology	8. Microsporangium & Female gametophytes
9. Ecological grouping of the plants	9. Megasporangium & female gametophytes
10.	10. fertilization
	11. Endosperm & Embryo

### **Aim and Objective**

1. Plant provides an essential foundation on earth, the food we eat, energy we consumed & the beauty of natural environment we see.
2. To make aware of student about conservation & sustainable use of plant.
3. To address socio-economical challenges related to plant science.
4. To make the students aware of applications of the different plants in the various industries.

### **Outcomes-**

1. The practical course is aimed to equip the students with skills & required for plant identification, description & also application of this plant in various industries.
2. It provides the scope & the opportunities for botany student in career making.

# **Applied Zoology I and II**

## **S.Y.B.Sc. -**

### **Sem I**

1. Fisheries
2. Agricultural pests and their control

### **sem II**

1. Apiculture
2. Sericulture

#### **Aim and Objectives:**

- The specific learning goals of applied Zoology are provide students with a working knowledge of apiculture and sericulture.
- Imparting training in mulberry cultivation silkworm rearing and silk rearing.
- To provide the technical and general knowledge necessary for fisheries management.
- To provide thorough knowledge about various animal sciences from primitive to highly evolved animal groups.
- To provide information, ideas and practical experience relating to fisheries and their management.

#### **Outcome:**

- The course will provide students with an opportunity to gain information regarding Honey bee species silk worm their rearing and commercial use.
- Student understood fish harvesting method as well as their importance.
- Student understood agricultural pest and their end their environmental effect.

# **Applied Zoology I and II**

## **S.Y.B.Sc. -2014-2015**

### **Sem I**

1. Fisheries
2. Agricultural pests and their control

### **sem II**

1. Apiculture
2. Sericulture

#### **Aim and Objectives:**

- The specific learning goals of applied Zoology are provide students with a working knowledge of apiculture and sericulture.
- Imparting training in mulberry cultivation silkworm rearing and silk rearing.
- To provide the technical and general knowledge necessary for fisheries management.
- To provide thorough knowledge about various animal sciences from primitive to highly evolved animal groups.
- To provide information, ideas and practical experience relating to fisheries and their management.

#### **Outcome:**

- The course will provide students with an opportunity to gain information regarding Honey bee species silk worm their rearing and commercial use.
- Student understood fish harvesting method as well as their importance.
- Student understood agricultural pest and their end their environmental effect.

**S.Y.B. Sc. (Physics)**  
**Semester I (Paper I) PH211:**  
**(2016-17)**  
**MATHEMATICAL MEHODS IN PHYSICS**

**Aims And Objectives:**

1. To provide in depth knowledge of scientific and technological aspects of Physics
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hand on activities, study visits, projects etc.
4. To train students in skills related to research, education, industry, and market.
5. To create foundation for research and development in Electronics
6. To develop analytical abilities towards real world problems
7. To help students build-up a progressive and successful career in Physics

**Outcomes:**

After the completion of this course students will be able to

1. Understand the complex algebra useful in physics courses
2. Understand the concept of partial differentiation.
3. Understand the role of partial differential equations in physics
4. Understand vector algebra useful in mathematics and physics
5. Understand the singular points of differential equation

**S.Y.B. Sc. (Physics)**  
**Semester I (Paper II) PH212:**  
**ELECTRONICS (2016-17)**

**Aims And Objectives:**

1. To provide in depth knowledge of scientific and technological aspects of Physics
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hand on activities, study visits, projects etc.
4. To train students in skills related to research, education, industry, and market.
5. To create foundation for research and development in Electronics
6. To develop analytical abilities towards real world problems
7. To help students build-up a progressive and successful career in Physics

**Outcomes:**

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

1. Apply laws of electrical circuits to different circuits.
2. Understand the relations in electricity
3. Understand the properties and working of transistors.
4. Understand the functions of operational amplifiers.
5. Design circuits using transistors and operational amplifiers.
6. Understand the Boolean algebra and logic circuits

**S.Y.B. Sc. (Physics)**  
**Semester II (Paper I) PH221:**  
**(2016-17)**  
**OSCILLATIONS, WAVES AND SOUND**

**Aims And Objectives:**

1. To provide in depth knowledge of scientific and technological aspects of Physics
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hand on activities, study visits, projects etc.
4. To train students in skills related to research, education, industry, and market.
5. To create foundation for research and development in Electronics
6. To develop analytical abilities towards real world problems
7. To help students build-up a progressive and successful career in Physics

**Outcomes:**

On completion of this course, the learner will be able to:

1. Understand the physics and mathematics of oscillations.
2. Solve the equations of motion for simple harmonic, damped, and forced oscillators.
3. Formulate these equations and understand their physical content in a variety of applications,
4. Describe oscillatory motion with graphs and equations, and use these descriptions to solve problems of oscillatory motion.
5. Explain oscillation in terms of energy exchange, giving various examples.
6. Solve problems relating to undamped, damped and force oscillators and superposition of oscillations. • Understand the mathematical description of travelling and standing waves.
7. Recognise the one-dimensional classical wave equation and solutions to it.
8. Calculate the phase velocity of a travelling wave.
9. Explain the Doppler effect, and predict in qualitative terms the frequency change that will occur for a stationary and a moving observer.
10. Define the decibel scale qualitatively, and give examples of sounds at various levels.
11. Explain in qualitative terms how frequency, amplitude, and wave shape affect the pitch, intensity, and quality of tones produced by musical instruments

**S.Y.B. Sc. (PHYSICS)**  
**SEMESTER II (PAPER II) PH222:**  
**OPTICS(2016-17)**

**Aims And Objectives:**

1. To provide in depth knowledge of scientific and technological aspects of Physics
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hand on activities, study visits, projects etc.
4. To train students in skills related to research, education, industry, and market.
5. To create foundation for research and development in Electronics
6. To develop analytical abilities towards real world problems
7. To help students build-up a progressive and successful career in Physics

**Outcomes:**

1. This course will enable you to:
2. acquire the basic concepts of wave optics
3. describe how light can constructively and destructively interfere
4. explain why a light beam spreads out after passing through an aperture
5. summarize the polarization characteristics of electromagnetic waves
6. appreciate the operation of many modern optical devices that utilize wave optics
7. Understand optical phenomena such as polarisation, birefringence, interference and diffraction in terms of the wave model.
8. analyse simple examples of interference and diffraction phenomena.
9. be familiar with a range of equipment used in modern optics.

Mathematics  
Sem I Paper I  
Multivariable calculus I  
S. Y. B. Sc 2016-17

## **Aims:**

- i) Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of the power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.
- ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.
- iii) Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

## **Objectives:**

- (i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- (ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- (iii) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
- (iv) A student be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- (v) A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.

## **Outcomes**

- (i) Compute limits and derivatives of algebraic, trigonometric, and piece-wise defined functions,
- (ii) Compute definite and indefinite integrals of algebraic and trigonometric functions using formulas and substitution,
- (iii) Use the derivative of a function to determine the properties of the graph of the function and use the graph of a function to estimate its derivative,

Mathematics  
Sem I Paper II  
Laplace transform and Fourier Series  
S. Y. B. Sc 2016-17

**Aims:**

- i) Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of innumerable power of mathematical ideas and tools and know how to use them by modeling, solving and interpreting.
- ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.
- iii) Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment
- . iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

**Objectives:**

- (i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- (ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- (iii) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
- (iv) A student be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- (v) A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.

**Outcomes:**

1. Solve linear differential equations using the Laplace transform technique,
2. Explain the connection between complex numbers and Fourier transforms to convolutions, filters, and their properties,

## **Physical Chemistry (CH-331), Term-I, Sem-III**

### **Topic:-**

1. Chemical Kinetics
2. Electrolytic Conductance
3. Investigation of Molecular Structure
4. Phase Rule

### ***Aims and objectives:***

#### **Students should know**

After studying this syllabus students are expected to know rate constant  $k$  for third order reaction, Derivation of Arrhenius equation, Variation of specific and equivalent conductance of strong and weak electrolyte with dilution vii. Meaning of infinitely dilute solution, Understand the term specific volume, molar volume and molar refraction, Rotational / Microwave spectroscopy ,Derivation for rotational spectra for the transition from  $J$  to  $J+1$ , Meaning and Types of equilibrium such as true or static, metastable and Unstable equilibrium.

### **Outcomes:-**

1. Student understood the Methods to determine order of reaction. Effect of temperature on reaction rate, Arrhenius equation, Variation of specific and equivalent conductance of strong and weak electrolyte with dilution, . Hittorf's rule.
2. Student understand the term specific volume, molar volume and molar refraction, Solve the numerical problems based on Vibrational rotational Spectra rotational spectra.Explaine of water, sulphur , two component system.

## Physical Chemistry (CH-341), Second Term, Sem-IV

### Topic:-

1. Electrochemical Cells
2. Nuclear Chemistry
3. Crystal Structure
4. Quantum Chemistry

### *Aims and objectives:*

#### **Students should know**

After studying this syllabus students are expected to know What is mean by Electrochemical cell with specific example, Nernst Equation for theoretical determination of EMF, Thermodynamics and EMF: Relation of EMF with  $\Delta G$ ,  $\Delta G^\circ$ ,  $\Delta H$ ,  $\Delta S$  and equilibrium constant  $K$  of the cell reaction. .Discovery of radioactivity, Unit of Radioactivity :.Curie Bq, Measurement of radioactivity, Distinguish between crystalline and amorphous solids / anisotropic and isotropic solid, Bragg's experiment and Derivation of  $(n\lambda = 2d\sin\Theta)$ Bragg's equation, Concept of quantization, time independent Schrodinger wave equation.

### **Outcomes:-**

1. Student understood Application of EMF measurement, Nernst Equation for theoretical determination of EMF.
2. Student classified of nuclides & gives application of radioisotopes
3. Student explains the Structure of NaCl can be ascertained with the help of X-ray analysis.
4. Student explains time independent Schrodinger wave equation. For Particle in a box ( 1 and 3 dimensional).

**Organic Chemistry (CH-333),  
First Term, Semester III**

**Topic:-**

1. **Organic Structures, nomenclatures, Properties and Reactivities**
2. **Stereochemistry of disubstituted cyclohexane**
3. **Nucleophilic substitution at aliphatic Carbon**
4. **Reactions of Carbon –Carbon double bond & triple bond**
5. **Reactions of Carbon –Oxygen double bond:**
6. **Oxidation & Reduction reactions**
7. **Elimination Reactions.**

***objectives:***

Students should know –

1. Structure identification, nomenclature, properties of different organic compounds.
2. To distinguish between geometrical and optical isomerism
3. Stability, energy calculations with potential energy diagram and optical activity of conformers.
4. Different types of nucleophilic substitution reactions
5. The comparison between  $S_N1$  &  $S_N2$  reactions
6. An  $S_Ni$  mechanism in presence and absence of pyridine
7. Different types of carbon-carbon unsaturated compounds
8. Orientation / rules in addition reactions
9. The structure of carbonyl group
10. Types of some known addition reactions
11. Definition and types of elimination reactions
12. Different type of oxidizing and reducing reagent and its applications
13. Statement of Hoffmann and Saytzeff rule
14. Comparison between  $E1$  &  $E2$  reactions
15. The effect of structure, attacking and leaving group on reactivity of  $E1$  &  $E2$  reactions

**Outcomes:-**

1. Students understood about different type of organic compound, their nomenclature, properties and reaction.
2. Student understood stereochemistry of disubstituted cyclohexane, its stability and isomerism
3. Student understood about  $S_N1$ ,  $S_N2$  &  $S_Ni$  reaction and its mechanism
4. Students understood different type of addition reaction in  $C=C$  and  $C=O$  compounds
5. Students understood use and application of different oxidizing and reducing agent
6. Student understood about  $E1$ ,  $E2$  &  $E1c_b$  reaction and its mechanism

**Organic Chemistry (CH-343)**  
**Semester IV: (Second Term)**

**Topic**

1. Carbanions and their reactions
2. Retrosynthetic analysis and applications
3. Rearrangement reactions
4. Spectroscopic methods in structure determination of Organic compounds
  - a. Introduction:
  - b. Ultra Violet Spectroscopy
  - c. Infra red Spectroscopy
  - d. NMR Spectroscopy (Only PMR)
5. Natural Products
  - a. Terpenoids:-
  - b. Alkaloids:-

**Aims and objectives:** Students should know –

1. Definition and formation of carbanions
2. Synthetic applications of malonic ester & aceto acetic ester
3. What is retrosynthesis? & Meaning of terms involve in retrosynthesis
4. What is rearrangement reaction?
5. What is Spectroscopy? & Different regions of electromagnetic radiations
6. What is the interaction of radiation with matter
7. Brief idea about the advantages of spectroscopic methods
8. What is UV Spectroscopy and Beer's law?
9. Various terms used in UV spectroscopy
10. To calculation of  $\lambda_{max}$  for dienes and enone systems
11. Applications of UV Spectroscopy
12. What is IR Spectroscopy?
13. To determine structure and follow the course of reaction by IR spectrum
14. What is the principle of PMR? & Various terms used in PMR spectroscopy.
15. Why TMS is used as a reference compound?
16. What are terpenoids and alkaloids?
17. Various methods of isolation/extraction of these natural products.
18. Synthesis of Citral and Ephedrin by Barbier- Bouveault and Nagi methods, respectively.
19. To determine the structure of above compounds by chemical methods.

**Outcomes:-**

1. Student understood carbanion structure, stability and reaction involving cabanion
2. Students understood application of malonic ester and acetoacetic ester in organic synthesis
3. Student understood concept of retrosynthesis and synthesis of some organic molecules
4. Student understood concept of rearrangement reaction, its type with example
5. Student understood concept of spectroscopy its different type and its application in structure determination of organic molecules
6. Student become able for data interpretation or structure determination of different organic molecules
7. Student understood natural product -its structure determination & synthesis such as terpenoids and alkaloids with example

**Semester-IV**  
**Analytical Chemistry (CH-344)**

**Topic**

1. Solvent Extraction
2. Chromatography
3. Gas Chromatography
4. High Performance Liquid Chromatography
5. Electrophoresis
6. Nephelometry and Turbidimetry

**Aims and Objectives**

A student should know,

1. Principles of solvent extraction, Various types of techniques of solvent extraction such as- extraction, continuous extraction, counter current extraction.
2. Principle of chromatographic methods
3. Relation between theoretical plates and column efficiency
4. Technique and applications of- Column Chromatography,
5. Technique and applications of- Thin layer Chromatography
6. Technique and applications of- Paper Chromatography
7. Technique and applications of- Ion exchange Chromatography
8. Principle of GSC and GLC analysis
9. Separation mechanism involved in GSC and GLC
10. Separation mechanism involved in adsorption and partition HPLC
11. Instrumentation and working of HPLC, Applications of HPLC
12. Advantages of supercritical fluid chromatography
13. Comparison between electrophoresis and chromatography
14. Principle and theory of electrophoresis, its types of electrophoresis and application
15. Nephelometry and Turbidimetry as an analytical tool
16. Difference between Nephelometry and Turbidimetry

**Outcomes:-**

1. Student understood solvent extraction technique, its type and application
2. Student understood concept of chromatography, its different type and its application
3. Student understood GSC & GLC analytical technique
4. Student understood HPLC as analytical technique and its application
5. Student understood nephelometric and turbidimetric analysis
6. Student understood concept of electrophoresis

**Analytical Chemistry**  
**Paper CH-334 Semester –III**

## **Topic**

1. Gravimetric Analysis
2. Thermal methods of analysis
3. Spectrophotometry
4. Polarography
5. Atomic Absorption Spectroscopy
6. Flame Emission Spectroscopy

## **Aims and Objectives**

Student should know,

1. Principles of common ion effect and solubility product
2. Formation of complex ion
3. Meaning of co-precipitation and post precipitation
4. Methods of thermo gravimetric analysis
5. Principles of TGA and DTA
6. Types of TGA
7. Applications of TGA, DTA and DSC
8. Principles of Spectrophotometric analysis and properties of electromagnetic radiations
9. Different Terms like absorbance, transmittance, and molar absorptivity
10. Mathematical Statement and derivation of Lambert's Law and Beer's Law
11. Instrumentation and working of single and double beam spectrophotometer
12. Voltammetry and polarography as an analytical tool
13. Construction, working, advantages and disadvantages of DME
14. Different terms involved in Ilkovic equation
15. Measurement of absorbance of atoms by AAS.
16. Interferences in atomic absorption spectroscopy
17. Emission spectroscopy as an analytical tool
18. Measurement of emission of atomic species
19. Application and numerical problems.

## **Outcomes:-**

1. Student understand concept of gravimetric analysis and different terms and factor involve in gravimetric analysis
2. Student understood thermogravimetric analysis and its application
3. Student understood faradays law and its application in electrogravimetric analysis
4. Student understood principle, type and application of spectrophotometry
5. Student understood concept of voltametry and polarography in analysis
6. Student understood concept of atomic absorption spectroscopy and its application
7. Student understood concept of flame emission spectroscopy and its application
8. Student understood nephelometric and turbidometric analysis and its industrial application
9. Student become able to solve numerical problems of all above topic

**Industrial Chemistry (CH-335),  
First Term, Semester III**

**Topic:-**

1. Modern Approach to chemical Industry.
2. Agro chemicals
3. Manufacture of basic chemicals
4. Petro chemical & eco-friendly fuels
5. Food & Starch Industry
6. Cement & glass Industry

***Aims and objectives:***

Students should know –

1. Importance of chemical industry.
2. Knowledge of various industrial aspects.
3. Concept of basic chemicals.
4. Food preservation & food additives.
5. Manufacture of cement by modern method.
6. Fuels & Eco-friendly fuels, use of solar energy.

**Outcomes:-**

1. Students understood about Importance of chemical industry.
2. Student understood Food preservation & food additives.
3. Student understood Chemistry of starch.
4. Student understood Synthesis & use of various insecticides, pesticides.

## **Industrial Chemistry (CH-345), Second Term, Semester IV**

### **Topic:-**

1. Polymer chemistry
2. Sugar & fermentation Industry
3. Soap, detergent & Cosmetics.
4. Dyes & Paints.
5. Chemistry of Pharmaceuticals industry.
6. Pollution, Prevention & Waste management.

### ***Aims and objectives:***

Students should know –

1. Basic of polymers.
2. Importance of sugar industry.
3. Properties & various types of cosmetics.
4. Introduction of paints.
5. General aspects of drug action.
6. Synthesis & uses of drug molecules.

### **Outcomes:-**

1. Students understood about meaning of the terms of the various drugs.
2. Student learns all the problems of pollution & disposal of waste of various industries.
3. Student understood different types of soap products.
4. Student understood manufacture of wine, beer, whisky, rum etc.