FOURTH SEMESTER								
1	B21PC4010	Physics-IV	HC	3	30	70	100	4
2	B21PC4020	Chemistry-IV	HC	3	30	70	100	4
3	B21PC4030	Chemistry-V	HC	3	30	70	100	
4	B21PC4040	Mathematics-IV	HC	3	30	70	100	4
5	B21PC4050	Mathematical Modelling	HC	3	30	70	100	4
6	B21PC4060	Industrial Management and Quality Control	FC	2	15	35	50	3
		Practicals						
7	B21PC4070	Physics Lab –IV	HC	2	15	35	50	3
8	B21PC4080	Chemistry Practical-IV	HC	2	15	35	50	3
9	B21PC4090	Mathematics - IV Lab	HC	2	15	35	50	3
		Total Credits		**23**			**700**	**31**

Fourth Semester

Course Code	Course Title	Course Type	L	T	P	C	Hrs/ Week
B21PC4010	Physics-IV	HC	2	1	0	3	4

Course Objectives:

The Objectives of this course are to make students to learn:

- Make the students to understand the basic concepts of electric field, potential, electric flux, expression for capacitance and charge stored in capacitor.
- Explain the concepts of magento-statics, magnetic field and force, magnetic properties of the materials.
- Concepts of transient currents and alternating currents.
- Students will able to understand the basic concepts of electromagnetism in physics for practical application.

Course Outcomes:

After the successful completion of course, students are able to understand:

- The vector algebra (scalar and vector product) and basic concepts of electrostatics.
- Concepts of magnetic properties of materials and laws, magnetic field and force, expressions.
- Expression for maxwell's equation and nature of EM waves.
- The concept of theory of CR, LR and LCR circuits.
- Concepts of alternating current, response of LR, CR, LCR circuits to sinusoidal voltages, Power in electrical circuits.
- Solve the numerical problems related to concepts of physics.

Course Content:

UNIT I **(12 hrs)**

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem in electrostatics. Applications of Gauss theorem: Electric field due to point charge, Electric field due to infinite line of charge, Electric field due to uniformly charged Sperical shell and solid sphere. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, and potential due to uniformly charged Sperical shell and solid sphere. Expression for capacitance of an isolated spherical conductor and parallel plate capacitor. Energy stored in capacitor. Dielectric medium, polarisation, displacement vector (qualitative).-Problems.

UNIT II **(12 hrs)**

Magneto-statics: Biot-Savart's law & its applications- magnetic field due to straight conductor of finite length, Expressions for magnetic field: centre of a circular coil and solenoid carrying current. Divergence and curl of magnetic field. Ampere's circuital law and its application to determination of magnetic field on the axis of solenoid.

Magnetic Fields and Force: Expression for motion of a charged particle in a magnetic field, expression for magnetic force on a current carrying conductor, Torque acting on a current loop –problems.

UNIT III **(12 hrs)**

Magnetic properties of materials: Brief explanation-Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Properties of para- dia- and ferro-magnetic materials.

Maxwell's equations and Electromagnetic wave propagation: Expression for equation of continuity of current, Derivation of Maxwell's equations (four equations), Maxwell's correction to Ampere's law, Displacement current, Expression for velocity electromagnetic wave through vacuum and isotropic dielectric medium, transverse nature of EM waves (proof), energy density equally in an electromagnetic field.

UNIT IV **(12 hrs)**

Transient Currents: Theory of CR circuit (charging and discharging)-LR circuit (growth and decay) - LCR circuit (discharging).

Alternating current: Mean and RMS value Alternating current. Response of LR, CR, and LCR circuits to sinusoidal voltages. Series and parallel resonance, half power frequencies, band width and Q-factor and its significance, effect of resistance, frequency and quality factor. Power in electrical circuits, power factor. Maximum power transfer theorem for ac circuits- Numerical problems.

NOTE: In order to enhance the understanding of the subject, numbers of problems are to be worked out in each section.

Reference Books:

1. Undergraduate Physics Vol-II, Electrostatics and Magnetism, Niruta Publications, Bangalore.
2. Electricity and Magnetism, Edward M. Purcell.
3. Electricity and Magnetism, J.H. Fewkes& J. yarwood. Vol.I
4. Electricity and Magnetism, D CTayal
5. University Physics, Ronald LaneReese.
6. Introduction to Electrodynamics, D. J. Griffi ths
7. Electrical Networks, B. L.Theraja.
8. Electricity and Magnetism, K. K.Tiwari.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC4020	**Chemistry-IV**	**HC**	**2**	**1**	**0**	**3**	**4**

Course Objectives:

1. Students will understand various interactions in liquid mixtures and their effect on mixture properties.
2. Students will know the effect of temperature on the behavior of miscible and immiscible liquids.
3. Students will get to know the principle of Rault's law its significance.
4. Students will study the principles of fractional distillation, its principles and its applications.
5. Students able to understand various physical properties of solute and solvent mixture and their interactions.
6. Basic concepts of chemical bonding, Ionic bonding, Covalent Bonding etc.
7. Aromaticity of hydrocarbons, their hydrogenation with aromatic compounds.
8. Basic concepts of binary mixtures, laws of miscibility, fractional distillation etc.
9. Concepts of vapour pressure, elevation of boiling points, cryoscopic constant, isotonic solutions, plasmolysis etc.

Course Outcomes:

After successful completion of this coursethe students shall be able to:

1. Know various properties of liquids and interpret their behaviour, along with understanding the concept of ideality of solutions based on Rault's law.
2. Predict the behaviour of binary mixtures with temperature and the effect of solute on temperature.
3. Understand the vapour pressure concept with the help of Rault's law and study the deviation from ideality.
4. Appreciate the significance of fractional distillation principle and its applications in the separation of various fractions in a given mixture.
5. Understand the effect of salt addition on boiling and freezing points of solvents and its significance.
6. Explain methods for the determination of depression in freezing point and elevation of boiling point.
7. Appreciate the understanding of membrane preparation and its application in separation technology.
8. Really understand the influence of osmosis in separation process of mixture of gases / liquids and also realize its wide applications in chemistry and medical field.
9. Have firm foundations in the nature of chemical bonding and its properties.
10. Identify the electrophilic substitution reactions mechanism and other effects on electron donating groups, different reactions and mechanism.
11. Analyze different applications of mixtures and their types in various Industries.

12. Paraphrase the concepts of vapour pressure, molar mass, osmotic pressure and their relations.

Course Content:

UNIT-I **12 hrs**

P- Block Elements

Boron: Boron hydrides – Diborane, preparation, structure and uses.

Silicon: Silicates – types and structure with one example for each type.

Halogens: Bleaching powder – preparation, properties and uses.

Interhalogen Compounds: Definition, types with examples, general methods of preparation (by direct combination of halogen, from lower inter halogens) and properties (physical state, thermal stability, reactivity and hydrolysis).

Noble gases: Chemical properties and applications of noble gases, chemistry of xenon, preparation and structure of xenon compounds (XeF_2, XeF_4, XeF_6, XeO_3 and XeO_4).

UNIT-II

Non-aqueous solvents: Types of solvents and their general characteristics. Reactions in non aqueous solvents with respect to Liquid ammonia- ionization, precipitation, ammonolysis, complex formation and redox reactions. Ionization of weak acids, advantages and disadvantages. Alkali metals in liquid ammonia.

Liquid SO_2- Solvent properties, typical reactions-acid-base, solvolysis, precipitation, amphoteric and redox.

HSAB: Classification of acids and bases as Hard and Soft. Pearson's HSAB concept, acid-base strength, hardness and softness.

UNIT- III **12hrs**

Amines: - Classification and nomenclature with examples. Preparation of amines, ammonia separation of mixture of amines by Hinsberg's method. Basicity of amines-comparative study on the basicity of 1°, 2°, 3° aliphatic and aromatic amines. Identification of 1°, 2°, 3° amines by Hoffmann's exhaustive methylation method. Diazonium compounds- Preparation, reactions-conversion to halo benzene, phenol and azo compounds.

Dyes: Introduction, colour and constitution, chromophore-auxochrome theory-modern theory of colours, classification of dyes based on applications with examples, synthesis and uses of cango red, and indigo.

UNIT-IV **12hrs**

Alcohols:- Classification and nomenclature of alcohols with examples.

Monohydric alcohols:- Distinguishing tests between primary, secondary and tertiary alcohols (oxidation, Victor Meyers and Lucas methods).

Dihydric alcohols:- Preparation of ethylene glycol from alkenes and from vicinal halides, properties (oxidative cleavage using lead tetra-acetate) and uses.

Trihydric alcohols:- Glycerol-preparation from propylene, reactions of glycerol with HNO_3, H_2SO_4, oxalic acid and HI. Uses of glycerol.

Phenols:- Classification and nomenclature with examples. Acidity of phenols, effect of substituents on acidity of phenols (ortho, meta, para - nitrophenol and ortho, meta, para-cresol). Reaction and mechanism of Kolbe's, Fries and Claisen rearrangement. Comparison of the acidity of alcohols and phenols.

Reference Books:

- Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).
- Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co.: New York (1985).
- Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). •Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7 thEd., W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. &Stryer, L. Biochemistry, W.H. Freeman, 2022.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC4030	**Chemistry-V**	**SC**	**2**	**1**	**0**	**3**	**4**

Course Outcomes:

After studying this course student will be able to understand:

- The concepts of chemical analysis, accuracy, precision and statistical data treatment.
- Prepare the solutions after calculating the required quantity of salts in preparing the reagents/solutions and dilution of stock solution.
- Understand principles of titrimetric analysis.
- Understand principles of different type's titrations. Titration curves for all types ofacid–base titrations.
- Gain knowledge about balancing redox equations, titration curves, theory of redox indicators and applications.
- Understand titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.
- Indicators for EDTA titrations - theory of metal ion indicators. Determination ofhardness of water.
- Understand the terminologies of colloids and also the formation of CMC and the role of surfactant.
- Understand the concept of corrosion and electroanalytical techniques.

UNIT –I: Analytical chemistry **14 Hours**

Language of analytical chemistry: Definition of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method - accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD), Limit of quantification (LOQ), linear dynamic range (working range).

Errors and treatment of analytical data: Limitations of analytical methods – Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples - mean, median, range, standard deviation and variance. External standard calibration - regression equation (least squares method), correlation coefficient (R2). Numerical problems.

Basic laboratory practices: calibration of glassware (pipette, burette and volumetric flask), Sampling (solids and liquids), weighing, drying, dissolving, Acid treatment, Rules of work in analytical laboratory, General rule for performing quantitative determinations (volumetric and gravimetric), Safety in Chemical laboratory, Rules of fire prevention and accidents, First aid. Precautions to be taken while handling toxic chemicals, concentrated/fuming acids and organic solvents.

UNIT-II: 14 hours

Titrimetric analysis: Basic principle of titrimetric analysis. Classification, Preparation and dilution of reagents/solutions. Normality, Molarity and Mole fraction. Use of $N_1V_1= N_2V_2$ formula, Preparation of ppm level solutions from source materials (salts), conversion factors. Acid-base titrimetry: Titration curves for strong acid vs strong base, weak acid vs strong base and weak base vs strong acid titrations. Titration curves, Quantitative applications – selecting and standardizing a titrant, inorganic analysis - alkalinity, acidity. Complexometric titrimetry: Indicators for EDTA titrations - theory of metal ion indicators, titration methods employing EDTA - direct, back, displacement and indirect determinations, Application- determination of hardness of water.

Redox titrimetry: Balancing redox equations, calculation of the equilibrium constant of redox reactions, titration curves, Theory of redox indicators, calculation of standard potentials using Nernst equation. Applications. Precipitation titrimetry: Titration curves, titrants and standards, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.

Unit III - Colloids

Colloids: Colloidal systems, classification of colloids, lyophobic and lyophilic sols, preparation of lyophobic colloidal solutions (dispersion and condensation methods), And purification of colloidal solutions, Properties of colloidal systems: Electrical properties – charge on colloidal particles, zeta potential, DLVO theory of the stability of lyophobic colloids, flocculation values, coagulation of colloidal solutions.

ElectrokineticProperties – electrophoresis and electro-osmosis streaming and sedimentation potential. Determination of size of colloidal particles, surfactants. Emulsions, gels, elastic and non-elastic gels. Micelle formation – mass action model and phase separation model, shape and structure of micelles, micellar aggregation numbers, critical micelle concentration (CMC), factors affecting CMC in aqueous media.

UNIT-IV 16 hrs

Corrosion: Introduction, Importance and principles, Forms of corrosion (Galvanic, Atmospheric, stress, microbial and soil). Techniques of Corrosion rate measurement (instrumental and non-instrumental). EMF series &Galvanic series and their limitations. Thermodynamics (Pourbaix diagram).Concept of mixed potential theory, effect of oxidizer and passivity of corrosion. Anodic and cathodic protection, inhibitors, coating).

Analytical Applications of Electrochemistry -Principles and Applications of Cyclic voltammetry, Coulometry and Amperometry.

References:

1. Physical Chemistry by P.W. Atkins, ELBS, 5th edition, Oxford University Press (1995).
2. Text Book of Physical Chemistry by Samuel Glasstone, MacMillan Indian Ltd., 2nd edition (1974). 3. Elements of Physical Chemistry by Lewis and Glasstone.
3. Fundamentals of physical chemistry – Maron and Lando (Collier Macmillan) 1974.
4. Thermodynamics for Chemists by S. Glasstone, Affiliated East-West Press, New Delhi, (1965).

5. Chemical Thermodynamics by I.M. Klotz, W.A. Benzamin Inc. New York, Amsterdam (1964).
6. Jeffery, G.H., Bassett, J., Mendham, J.& Denney, R.C.
7. Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & Sons, 1989.
8. Willard, H. H., Merritt, L.L., Dean, J. & Settle, F.A. Instrumental Methods of Analysis, th7 Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
9. Christian, G.D; Analytical Chemistry, VI Ed. John Wiley & Sons, New York, 2004.
10. Harris, D. C. Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
11. Skoog, D. A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed, 2017.
12. Ditts, R.V. Analytical Chemistry; Methods of Separation, van Nostrand, 1974

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC4040	**Mathematics-IV**	**HC**	**2**	**1**	**0**	**3**	**4**

Course Learning Objectives: This course will enable the students to:

- Obtain numerical solutions of second order linear differential equations and Total differential equations
- Learn the basic concepts of Partial differential equations.
- To solve the Riemann integration and Fundamental theorem of Calculus.
- To solve the various types of Line and Multiple Integrals.
- Apply various numerical methods in real life problems.

Course Outcomes: On completion of this subject, students will be able to:

- Analyse the solutions of second order linear differential equations and Total differential equations.
- Understand the basic concepts of Partial differential equations.
- Apply the knowledge to solve the Riemann integration and Fundamental theorem of Calculus
- Analyse the various types of line and multiple integrals.

UNIT I: Partial differential equations 12 Hrs

Basic concepts – Formation of a partial differential equations by elimination of arbitrary constants and functions – Solution of partial differential equations (PDE) – Solution of non-homogeneous PDE by Direct integration, solution of homogenious PDE involving derivatives with respect to one independent variable only, Solution of PDE by the method of separation of variables, Lagrange's linear equations of the form Pp + Qq = R.

UNIT II: Linear differential equations 12 Hrs

Solution of ordinary second order linear differential equations with variable coefficient by various methods such as:

(i) Changing the independent variable.
(ii) Changing the dependent variable.
(iii) By method of variation of parameters.
(iv) Exact equations.

Total differential equations - Necessary and sufficient condition for the equation Pdx + Qdy + Rdz = 0 to be exact (proof only for the necessary part).

UNIT III: Riemann integration **12 Hrs**

The Riemann integral – Upper and lower sums – Criterion for integrability – Integrability of continuous functions and monotonic functions. Fundamental theorem of Calculus (Statement only) – Problems, Integration as a limit of sum (problems only)

Unit IV: Line and Multiple Integrals **12 Hrs**

Definition of line integral and basic properties – Examples on evaluation of line integrals.
Definition of a double integral – Conversion to iterated integrals – Evaluation of double integrals under given limits - Evaluation of double integrals in regions bounded by given curves. Changing the order of integration. Definition of a triple integral – Evaluation – Change of variables (Cylindrical and Spherical) – Volume as a triple integral.

Reference Books:

1. G. Stephonson – An introduction to Partial Differential Equations.
2. B. S. Grewal – Higher Engineering Mathematics
3. E Kreyszig- Advanced Engineering Mathematics, Wiley India Pvt. Ltd.
4. E D Reinville and P E Bedient – A Short Course in Differential Equations
5. D A Murray – Introductory Course in Differential Equations.
6. G P Simmons – Differential Equations
7. F. Ayres – Differential Equations (Schaum Series)
8. Martin Brown – Application of Differential Equations.
9. M D Raisinghania, Advanced Differential Equations, S Chand and Co. Pvt. Ltd., 2013.
10. S C Malik –Real Analysis
11. Leadership project – Bombay university- Text book of mathematical analysis
12. S S Bali – Real analysis, Golden Series. 13. Jon Rogawski, Multivariable Calculus, W. H. Freeman Company.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC4050	Mathematical Modeling	HC	2	1	0	3	4

Course Objectives:

1. To understand the concepts of Lattice theory and principle of duality in various fields.

2. To understand the concepts of groups and types of groups and Lagrange's theorem in various fields, Burnside's theorem.

3. To understand the concepts of Sequence and Series.

4. To familiarize the concepts of Set Theory.

Course Outcomes:

After successful completion of the courses students shall be able to:

1. Apply the lattice theory to use of Boolean algebras in modeling and simplifying switching or relay circuits.
2. Apply the concepts of groups to find out the selection rules for spectroscopic transitions

3. Many real-life situations can be modelled using sequences and series.
4. Set theory is used in the areas pertaining to statistics; it is particularly used in probability.

UNIT I **(12 hrs)**
Lattice theory: lattices and algebras system, principles of duality, basics properties of algebraic systems defined by lattices, distributive and complimented lattices, Boolean lattices and Boolean algebras, uniqueness of finite Boolean expressions, prepositional calculus.

UNIT II **(12 hrs)**
Group theory: Groups, subgroups, generators and evaluation of powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, automorphisms, homomorphism and normal subgroup, rings, integral domains and fields.

Unit III **(12 hrs)**
Sequence and Series: Sequence- Introduction, types of sequence, Arithmetic progression (A.P), Geometric progression (G.P).
Series: Introduction, Types of series, Arithmetic series, Permutation, Combinations.

UNIT IV **(12 hrs)**
Set Theory: Introduction, Definition and concepts, Representation of sets, Finite sets, Infinite sets (definition), Set Operations: Union, intersection, Addition theorem, Difference, Symmetric difference, D' Morgons law, Subsets, Power sets, Partition sets.

Reference Books:

1. C. L. Liu: Elements of Discrete Mathematics, Second Edition, TMH 2000.
2. B. K. Kalman: Discrete Mathematical Structure, Third Edition.
3. Karel Hrbacek and Thomas Jech, Introduction to Set Theory (Marcel Dekker, Third Edition, 1999).
4. K. H. Rosen: Discrete mathematics and its applications, Fifth edition, Tata McGraw Hill.

CourseCode	CourseTitle	Course Type	L	T	P	C	Hrs/ Week
BP21PC4060	Industrial Management and Quality Control	FC	2	0	0	2	2

Course Objectives

- Aims to increase learner's industrial performance and unique quality control skills to develop the attributes that enhance an individual's interactions, earning power and job performance.
- To impart the core understanding of industrial production, planning and control.

Course Outcome:

- The students, ongoing through the course, will able to take decision regarding production, planning, control and deciding plant location and layout

- The students will aware and able to measure industrial productivity and efficiency as well as students will maintain industrial discipline.
- Explore various methods of work study and evaluate standard time.
- Design various types of workspaces.
- Explain and implement various job evaluation methods.

Course content

UNIT I

Industry Concept: Production planning and control, Plant locations and layouts. Importance of Industrial Management in materials purchase, marketing, human resources, health and environment safety.

UNIT II

Industrial Management: Concept, meaning and definitions of Industrial management. Scope and application of Industrial management. Differences in Industrial and production management. Recent trends in industrial management

UNIT III

Quality Control: General prospects of quality control, definition of quality, Total quality management (quality inspection, quality control, quality assurance).

UNIT IV

Quality Management System: Quality management principles, policy and objectives. ISO Standard, Quality Audits. Principles and application of Quality assurance in production.

Reference books:

1. Industrial organization and Management by Tara Chand, Nem Chand and Brothers Roorkee.
2. Handbook of small scale Industry by P.M. Bhandari

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC4070	**Physics Lab - IV**	HC	0	0	2	2	3

Course Objectives:

1. Impart knowledge about various laws of electrostatistics through experiments
2. Facilitate with the concepts of transient and alternating current through experiments
3. Familiarise with the various experiments of electrostatistics and magnetostatistics
4. Impart knowledge about determination of physical constant through experiments

Course Outcomes:

After successful completion of this course the students shall be able to:

1. Verify various laws of electrostatistics and magnetostatistics through experiments
2. Analyse the concepts of transient and alternating current through experiments
3. Demonstrate the various experiments in electrostatistics and magnetostatistics
4. Determination of physical constant through experiments

Course Content:

Any **Eight** of the following Experiments are conducted.

1. Determination of cauchy's constants.

2. Parallel and series connection of capacitors - Measuring the charge with the electrometer amplifier.
3. Energy gap of intrinsic semiconductor.
4. To determine the capacitances and verify the laws of capacitances using De-Sauty's bridge temperature coefficient of resistance of a thermistor.
5. To determine the time constant during charging and discharging of a capacitor.
6. To determine a Low Resistance by Carey Foster's Bridge.
7. To determination of constants of Ballistic Galvanometer.
8. To determine Self-inductance of a given coil by using Anderson's Bridge.
9. To determine L and C for two different values by equal voltage method.
10. To determine a Low Resistance by Carey Foster's Bridge.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC4080	**Chemistry Lab-IV**	**HC**	**2**	**1**	**0**	**3**	**4**

GRAVIMETRIC ESTIMATIONS

1. Gravimetric estimation of barium as barium sulphate.
2. Gravimetric estimation of iron as iron (III) oxide.
3. Gravimetric estimation of copper as copper (I) thiocyanate.
4. Gravimetric estimation of nickel as nickel dimethylglyoximate.
5. Gravimetric estimation of magnesium as magnesium -8-hydroxy oxinate.
6. Gravimetric estimation of sulphate as barium sulphate.
7. Gravimetric estimation of aluminum as aluminum oxide.
8. Gravimetric estimation of zinc as zinc oxide.
9. Gravimetric estimation of calcium as calcium oxide.
10. Gravimetric estimation of lead as lead chromate.

Course Code	Course Title	Course Type	L	T	P	C	Hrs/Week
B21PC4090	**Mathematics Lab-IV**	**HC**	**0**	**0**	**2**	**2**	

Course contents:

Programs using scilab/Maxima /Python:

1. To solve second order LDE by changing the dependent variable
2. To test for exactness and solving second order LDE
3. To verify the condition for integrability of a total diffentitial equation
4. To solve first order non linear PDE containing p and q
5. To evaluate line integral with constant limits and variable limits
6. To evaluate double integral with constant limits and variable limits
7. To evaluate triple integral with constant limits and variable limits
8. To verify the given function is Riemann integrable or not over arbitrary closed interval.