Vivekanand Science College, Vivekanand nagar Hiwra Ashram) Dist. Buldhana

Science faculty:-

Programme Outcomes and course outcomes

Program: B.Sc.

Programme outcome:

After the successful completion of degree programme in Science, students should be able to:

PO-1: Demonstrate solve and understanding of major concepts in Science Subject.

PO-2: Solve the problem and also think methodically, independent and draw a logical conclusion.

PO-3: Inculcate the scientific treatment in the students and outside the scientific community.

PO-4: Inculcate scientific aptitude among the student.

PO-5: Make them to use scientific logics and soft skills.

PO-6: Train them in Technical skills and Technology.

Vivekanand science college, Vivekanand nagar

Department of Mathematics.

Course Outcome:-

B. Sc-I (Sem –I) Paper-I

Course Name: - Mathematics-I (Algebra and Trigonometry)

After the completion of this course student should be able to.

CO- I:-Understand de Moiver's theorem in finding the roots

CO –II:-To know trigonometric series

CO-III:- Understand theory of equation

CO-IV:-Solve Biquadratic equation

CO-V:-Find rank of matrix. Row rank and Column rank.

Department of Mathematics

Course Outcome:-

B. Sc-I (Sem –I) Paper-II

Course Name:- Mathematics-II Differential and Integral

After the completion of this course student should be able to.

CO-I:- Student will understand the basic concept and definition of a limit of a function and continuity.

CO-II:-Student will study and apply Leibnitz theorem for successive differentiation of multiplication of two different functions.

CO-III:-Student will verify Rolle's Theorem, Lagrange's theorem, mean value theorem and their application in solving problems

CO-IV:-Student will define homogeneous functions and study Eulers theorem for finding the differential equation

Department of Mathematics

Course Outcome

B. Sc-I (Sem –II) Paper-III

Course Name:- Mathematics-III Differential Equation

After the completion of this course student should be able to.

CO-I:- Understand ordinary differential equation

CO-II:-Student will be able to determine second order linear differential equation with constant coefficient

CO-III;- Learn the normal form, (removal for first order derivative) and apply method of variation of parameters.

CO-IV:- Student will understand partial differential equation and find the solution of the total partial differential equation of the first order.

CO-V:-Student will be able to solve compatible differential equation using charpits general method of orders.

Department of Mathematics

Course Outcome

B. Sc-I (SEM –II) Paper-IV

Course Name: - Mathematics- IV: Vector Analysis

After the completion to this course student should be able to.

CO-I: Understand scalar and vector product of three vectors.

CO-II: Student will be able to have knowledge of the geometry of space curve.

CO-III: Student will find and evaluate the work done and prove and apply the green theorem.

CO-IV: Learn intersection of sphere and a line condition of orthogonally of two intersecting spheres.

CO-V: Student will be able to study the equation of cone with guiding curve equation of cone with vertex and origin equation of right circular cylinder and its geometry.

Department of Mathematics

Course Outcome

B. Sc-II (Sem –III) Paper-V

Course Name: - Mathematics-V Advanced Calculates

After the completion of this course student should be able to.

CO-I: Student feel be able to understand knowledge and proof of theorem on limits of sequences bounded and monotonic sequence knowledge and proof of Cauchy convergence criteria.

CO-II: Student will be able to knowledge of series of non-negative terms of convergence of geometric series.

CO-III: Understand limit and continuity of function of two variable algebra of limit and continuity Taylors theorem for function of two variables.

CO-IV: Student will be able to define and find the maxima and minima of a function of two variable.

CO-V: Learn to evaluate the double integrals.

Department of Mathematics

Course Outcome

B. Sc-II (SEM –III) Paper-VI

Course Name: - Mathematics-VI Elementry Number Theory

After the completion of this course student should be able to:

CO-I: Understand the concept of the divisibility and their properties and result

CO-II: After completing these course students will be able to define and find prime numbers

CO-III: Learn the congruence and its properties

CO-IV: Student will be able to define and understand the concept of arithmetic function

CO-V: Student will be able to define and find the primitive roots.

Department of Mathematics

Course Outcome

B. Sc -II (SEM –IV) Paper-VII

Course Name: - Mathematics-VII Modern Algebra

After the completion of this course student should be able to:

CO-I: Understand group example properties of group subgroup cyclic group of order of generator of cyclic group.

CO-II: Student will be able to define and find cosets knowledge of statement and proof of languages theorem.

CO-III: Learn homomorphism, homomorphic image kernel of homomorphism isomorphism of a group.

CO-IV: Students will be able to define ring integral domain and filled and their result with example.

CO-V: Student will be able to define and verify left ideal right ideal example algebra of ideal Maximal ideal principal ideal question ring, ring homomorphism.

Department of Mathematics

Course Outcome

B.Sc.-II (SEM –IV) Paper-VIII

Course Name: - Mathematics-VIII Classical Mechanics

After the complication to this course student should be able to.

CO-I: Understand the concept of constant generalized coordinates.

CO-II: Learn areal velocity in Central orbit.

CO-III: Student will define and find the extremals, Euler's differential equation solution of Brachistochrone problem.

CO-IV: Student will able to define Hamiltonian of system.

CO-V: Student feel be able to find generalized coordinates of a rigid body, eulearian angles, eulearial theorem for finite rotations infinitesimal rotation.

Department of Mathematics

Course Outcome

B.Sc.-I (SEM –II) Paper-IX

Course Name: - Mathematics-IX Mathematical Analysis

After the complication to this course student should be able to.

CO-I; Student will able to define remain integral and its properties inter ability of continuous and monotonic function.

CO-II; Student will be able to have the knowledge of improper integral and their convergence comparison and limit test.

CO-III: Students develop knowledge in the limits continuity and differentiability of complex function analytic function Cauchy Riemann equation harmonic and conjugate function Milne Thomson method.

CO-IV; Student will have the knowledge of elementary function mapping by the elementary function mobius transformation fixed-point cross ratio inverse and critical point conformal mapping

CO-V: Students will be able to learn ideas of analysis.

Department of Mathematics

Course Outcome

B.Sc.-I (SEM –II) Paper-X

Course Name:- Mathematics-X Mathematical Method

After the complication to this course student should be able to.

CO-I: Students will be able to defined and solve Legendre's equation Legendre polynomials generating function of (x recurrence formula for Pn(x) method Legendre's polynomial Rodriguez formula for orthogonality of polynomial Rodriguez formula.

CO-II: Student will be able to apply the fundamental concept of Fourier series and Fourier series for odd and even function half range Fourier sine series and half range Fourier cosine series.

CO-III: Bessel equation solution of basal equation generating function for(x) recurrence formula (x) strun liouville boundary value problem.

CO-IV: Student will able to learn the method and properties of Laplace transform of some elementary function existence of Laplace transform properties of Laplace transform. Laplace transform of derivative and integral multiplication of t, n and division by t.

CO-V: Student will be able to apply the fundamental concept of finite Fourier transform Fourier sine transform, Fourier cosine transform and evaluate in proper integrals Infinite Fourier transform. Infinite Fourier sine transform and cosine transform, properties of Fourier transform.

Department of Mathematics

Course Outcome

B.Sc.-I (SEM –II) Paper-XI

Course Name: - Mathematics-XI Linear Algebra

After the complication to this course student should be able to.

CO-I: Student will be able to use the concept of vector space.

CO-II: Student will be able apply the properties of linear transformation to linearity of transformation kernel and rank of linearity transformation using rank nullity theorem inverse transformation to solve the problem of matrix transformation change of basis.

CO-III: Student will be able to define dual space bidual space.

CO-IV: Student will be able to use the concept of inner product spaces to find norm of a vector distance between vectors, check the orthogonality of vectors to find orthogonal and orthonormal basis.

CO-V: Student will be able to modules, sub modules, quotient modules homomorphism and isomorphism theorem.

Department of Mathematics

Course Outcome

B.Sc.-I (SEM –II) Paper-XII

Course Name: - Mathematics-XII Special Theory on Relative

After the complication to this course student should be able to.

CO-I: Student will be able to understand Newton's law of motion and their application and have the knowledge of inertial frame speed of light and Galilean relativity, relative character of space and time. Postulates of special theory of relativity, Lorentz transformation and its geometrical interpretation, group properties of transformation.

CO-II: Understand composition of parallel velocity length contraction time dilation.

CO-III: Learn 4 dimensional minkowskin time relativity time like space Like interval.

CO-IV: Understand variation of mass with velocity equivalent mass of mass energy transformation equation mass.

CO-V: Student get the knowledge of electromagnetic theory mathematically they will study Maxwell equation of electromagnetic theory in vacuum, scalar and vector potential gauge transformation, four dimensional formulation of the theory component of Tij in term of electric and magnetic strength.

DEPARTMENT OF COMPUTER SCIENCE

B. Sc - I (Semester - I)

Course Name: Web Technology and Advanced Programming in C.

After the complication to this course student will be able to.

CO – 1 : Understand the fundamentals of a Computer like architecture, input and output devices.

CO – 2 : Understand concept booting, Operating System and its types and coding schemes.

CO – 3 : Learn basics of Internet, Protocols, Web Browsers, search engines and email.

CO – 4 : Understand programming concept, problem solving using algorithms and flowcharts.

CO – 5 : Learn types of programming languages and basic elements of C language.

CO – 6 : Understand data types, operators and their precedence in C language.

CO – 7 : Perform various I/O operations in C programs.

B. Sc - I (Semester - II)

Course Name: Web Technology and Advanced Programming in C.

After the complication to this course student will be able to.

CO – 1 : To understand the concepts of web technology and additional features of C programming.

CO – 2 : To understand the fundamental knowledge of HTML, XML and Style sheet design web page.

CO – 3 : To understand the concept of markup languages and basic tags <HTML>, <HEAD>, <HTLE>, <BODY>etc.

CO – 4 : To understand <P>, <BP>, <Table>, List tag, <A>, <Link>, <IMG> tags, their attributes and values.

CO – 5 : To understand concept of Extensible Markup Language, its elements, DTD, etc.

CO – 6 : To understand the concept of style sheet, classes and IDs, their properties and values.

CO – 7 : To understand the concepts of array, pointers and string.

CO – 8 : To understand the concepts of function, its structure, union and file handling mechanism.

CO – 9 : To demonstrate the advanced C and Web technology practical.

B. Sc - II (Semester - III)

Course Name: Data Structures and OOPs with C++

After the complication to this course student will be able to.

CO – 1 : Understand the fundamental concepts of data structures with their types.

CO – 2 : Understand representation of stacks, queues, arrays and linked lists in computer memory and different operation performed on these data structure through algorithms.

CO – 3 : Understand the algorithms of different searching and sorting techniques and their applications.

CO – 4 : Understand OOP concept, basic of C++ programming language, classes, objects, different data types and operators in C++.

CO – 5 : Explain function in C++, different parameter passing techniques, inline and friend function.

CO – 6 : Discuss the concept, types and use of constructor and destructor.

CO – 7 : Describe the concept of operator overloading, inheritance, virtual and abstract base classes.

B. Sc - II (Semester - IV)

Course Name: Relational Database Management System and PL/SQL

After the complication to this course student will be able to,

CO – 1 : Understand the difference between traditional files system and present database management system, fundamental concepts of DMBS.

CO – 2 : Explain different data models used in database designing, deploying E-R diagrams to tables in Relational DBMS.

CO – 3 : Describe the concepts of Normalization in DBMS, different normal forms and their applications.

CO – 4 : Explain SQL, its basics and various DDL and DML commands to interact with Relational Database.

CO – 5 : Apply various SQL functions to the relational data in different tables.

CO – 6 : Implement PL/SQL programming concept on relational database.

CO – 7 : Describe cursor concept and its implementation on relational database.

CO – 8 : Understand concept of transaction processing and securities in database.

B. Sc - III (Semester - V)
.NET Technology and Java Programming

After the complication to this course student will be able to.

CO – 1 : Understand the Net technology's for designing and developing dynamics interactive and web application.

CO – 2 : Understand the concept of .NET Framework of Microsoft.

CO – 3 : Design and develop standard and professional console and Window based applications.

CO – 4 : understand the concept of Core Java and Object Oriented Paradigm.

CO – 5 : Use Java SDK environment to create, debug and run Java programs.

CO – 6 : Identify Java language, components and how they work together in applications.

CO – 7 : Understand the OOPs concept and its basic features such as classes, methods, method overloading, objects, exception handling, inheritance and polymorphism, etc.

CO – 8 : Understand the principle of Inheritance, Packages and Interfaces.

B. Sc - III (Semester - VI)
Course Name: Advance Java and VB.Net

After the complication to this course student will be able to.

CO – 1 : Understand the Event handling with the applications of AWT in Java.

CO – 2 : Understand the concepts of Exception Handling and Multithreading in Java.

CO – 3 : Understand applet and its use and Graphics Programming.

CO – 4 : Understand single and multiple form-based and menu-based techniques in .net application.

CO – 5 : Understand the use and handling controls in forms (Massage Box, Input Box), Windows MDI forms and controls.

CO – 6 : Understands the Object Oriented Programming and Exception Handling in .Net.

CO – 7 : Understanding the concept ADO.Net and learn how to connect Database by using ADO.net

CO – 8 : Understanding how to develop database application and different operations on database.

Department of Physics

Course Outcome

(B.Sc I. SEM-I)

Course Name: - Physics

After the complication to this course student should be able to.

CO-I: - Known the Newton low of gravitation and Kepler's law of planetary motion.

CO-II: - TO understand the concepts of rotational method.

CO-III: - TO understand above concepts through experiment in laboratory.

CO-IV: - Know the concept of elasticity and plasticity

CO-V: - To understand Bernoulli's theorem and Reynolds number.

Department of Physics

Course Outcome

B.Sc.-I (Sem-II)

CO-I

- Understand concept of kinetic theory of gases
- Learn degree of freedom, wonder wall equation of state
- Understand the process of thermal conductivity

- Viscosity and diffusion in gases

CO- II

- Understand basic concept of thermodynamics with three laws of thermodynamics
- Understand heat engine reversible and irreversible process

CO- III

- Understand method to produce low temperature liquefy air, hydrogen
- Learn thermodynamics relationship and Maxwell equations
- Heat equation thermodynamics potential equilibrium of thermodynamics system

CO- IV

- Understand working of electric gun ditches to linear accelerator
- Understand magnetic field mass fixed spectroscopy working of cyclotron

CO- V

- Understand network theorem baluster galvanometer and its application
- Learn Kirchhoff's law and analysis of multiloop circuit

CO- VI

- Understand rise and decay of current and charge in LR, CR and LCR circuit
- Understand the concept of AC current learn how to determine impedance and resistance of pure R, L, C and their combinations

Department of Physics

Course Outcome

B.Sc- II (Sem-III)

CO- I

- To understand the concept of mathematical physics such as gradient divergence and curl of vector fields line surface and volume integral
- To study gauss divergence theorem stokes theorem

- Know basic concept of electrostatics and its application

CO- II

- To study faraday's law Maxwell equations and wave equations for electromagnetic waves
- To understand poynting vector and poynting theorem

CO-III

- To understand basic concept of semiconductor electrical conduction charge carrier energy band mobility and conductivity
- To understand and study semiconductor diode and its pricing and working and director diode

CO-IV

- To study BJT its working construction mode of operation
- Study JFET- construction working characteristics
- Understand in detail amplifier
- Study of JFET construction working

CO-V

- Basic concept of special theory of relativity Lorentz transformation length contraction time dilation Einstein mass energy relation

CO-VI

- Study structure of each earthquakes composition of atmosphere
- To understand radiation in atmosphere moisture and cloud

Department of Physics

Course Outcome

B.Sc-II (Sem IV)

CO-I

- Understand optical lens system

- Learn interference Indian films due to reflected and transmitted light interference in which safe thin film
- Understand formation Newton drink measurement of fuel length of monochromatic light and refractive index of liquid by Newton

CO-II

- Understand difference between facial diffraction and frown or diffraction
- Understand single and slate diffraction
- Understand construction and theory don't plate plain transmission gravity now resolution of image

CO- III

- Basic concept of polarization feeds retardation plate study of production of electrically and circularly polarized light
- Study half said polar meter

CO-IV

- Know the history of LASER and it's basic concept
- To study Ruby laser, He-Ne laser, semiconductor laser
- Know application of laser

CO-V

- Basic concept of fiber optics classification of optical fiber
- TIR, Gain information of advantages and disadvantages of optical fiber and applications

CO-VI

- Know various renewable sources
- Know solar energy and positive gain of solar energy storage
- Study solar photovoltaic system-operating principal photovoltaic cell concept and solar pv it's application

Department of Physics

Course Outcome

B.Sc-III (Sem-V)

CO-I

- To understand origin of quantum mechanics describe the concept of your packet
- Now Davisson germer experiment
- To understand Heisenberg uncertainty principle and its verification using thought experiment and Gamma ray microscope

CO-II

- To understand concept of view function and its significance
- Now this got injured equations and its applications
- To understand agent functions and I gentle use and qualitative analysis of zero point energy

CO-III

- Understand vector atom model and study Stern generate experiment and different types of coupling
- Now the properties and types of X-rays
- To study for Raman effect and its basic principle

CO-IV

- Know about the detection of charged particle by using GM counter
- Understand concept of nuclear physics like Alpha decay, Beta decay concept of nuclear fission and fusion
- Study construction and working of nuclear reactor

CO-V

- Understand hybrid parameter of CE amplifier bias stability and thermal runaway
- Study RC coupled amplifier and its verification in gain with frequency
- Study noise and distortion in electronic circuit

CO-VI

- Know properties advantage and applications of negative feedback describe the construction and working of various types of oscillation and multivibrators

Department of Physics

Course Outcome

B.Sc- III (Sem –VI)

CO-I

- Understand the concept of phase space unit ceil microstate and macrostate
- Study concept of probability principle of equal priority probabilities and most probable distribution
- Maxwell Boltzmann statistics and its application

CO-II

- Study distinguishable and indistinguishable particles and understand concept of boson and fermions
- Compare Maxwell Boltzmann Bose Einstein and Fermi Dirac statistics and its outcomes
- Understand Fermi function Fermi energy and Fermi temperature

CO-III

- Distinguish between crystalline and amorphous solid
- Study to calculate atomic packing factor and cubic structure
- Explain symmetry elements and Bravais lattice
- Distinguish between various type of crystal imperfection

CO-IV

- Analyze the success and failure of free electron theory
- Study origin of band cap and classification of materials on the basis of band structure
- Understand hall effect and its application

CO-V

- Understand different types of magnetic materials
- Study classical and Quantum mechanical treatment of paramagnetism
- Study curious law and energy loss

CO-VI

- Understand superconductors and its type answer effect and application of superconductors
- Understand nonmaterial’s is physical properties and applications of nonmaterial in different field

Department of Zoology

Course Outcome

Course Name: Life and Diversity of Non-Chordata

B. Sc. I (SEM I)

After the completion of this course student should be able to-

- CO State the outline of animal classification of non-chordates.
- Knowledge about protozonal human diseases.
- Describe the morphology, habit and habitat. Systematic position and various systems in Sycon and Metridium
- Describe the morphology, habit and habitat. Systematic position and various systems in Fasciola and Ascaris.
- Describe the morphology, habit and habitat. Systematic position and various systems in Leech and Cockroach.
- Describe the morphology, habit and habitat. Systematic position and various systems in Pila and Asterias.
- Describe the morphology, habit and habitat. Systematic position and various systems in Fasciola and Ascaris.
- Describe body organization and affinities of Balanoglossus.
- Explain Structure and importance of coral reefs.
- Explain Parasitic Adaptations in helminthes and larval forms of Non-chordates.
- List of ten invertebrate phyla

CO Practical's

- After successfully completing this course, students will be able to:
- State outline classification of non-Chordate. List of ten invertebrate phyla.
- Enlist the various animals belonging to different phyla.
- To know the structures of various organs of non-chordate animals.
- To understand the Anatomy of leech and cockroach.
- To prepare permanent slides

B. Sc. I (SEM II)

Subject- Cell and Developmental Biology

CO

After successfully completing this course, students will be able to-

- Differentiate prokaryotic and Eukaryotic cells.
- Describe the structure and functions of Endoplasmic reticulum.
- Describe various Structural models of Plasma membrane with its function
- Describe the structure and functions of Golgi complex, Ribosome, Mitochondria and Lysosomes
- Explain the structure and functions of Nucleus, typical chromosomes and Giant chromosomes.
- Explain the cell division process and its significance.
- Describe the process of Gametogenesis.
- Explain the types and Mechanism of fertilization.
- Describe development up to Coelom formation in Amphioxus
- Explain development up to Gastrulation in frog and chick.
- Describe the development of extra embryonic membranes in chick
- Explain the various types of placenta in mammals.
- Describe parthenogenesis and regeneration in animals.
- Give elementary idea of Stem cells.

CO Practical

- Prepare gram staining.
- Use of microscope

- To prepare slides of polytene chromosomes.
- To prepare slides of various stages of Mitosis and Meiosis.
- Identify the stages of Gametogenesis in rat.
- Identify the different type's animal eggs.
- To explain the life cycle of Cockroach, housefly, Mosquito, butterfly.
- To demonstrate chick development.
- To identify developmental stages of frog and chick.
- To know the structure of placenta in mammals.

B. Sc. II (SEM III)

Subject- Life and Diversity of Chordata and Concept of Evolution

CO

- To state the classification of chordata.
- Classify phylum Protochordates to Class-Mammalia
- Students acquires anatomical knowledge of Amphioxus, Scoliodon, Frog, Calotes and Pigeon
- Gain knowledge of anatomy of vertebrates from Protochordates to Class Mammalia
- Impact knowledge of evolutionary processes ex. Darwinism, Lamarkinism, Speciation
- Understand the co-relation among animal species.
- Understand the Human Evolution
- Gain knowledge and Understanding of protection of endangered species, biodiversity, environmental conservation processes and its importance.

CO Practical's

- To state the classification of Chordata.
- To understand the anatomy through video, Models, Photographs
- Gain knowledge of bones of fowl and rabbit
- Gain knowledge of fossils and living fossils
- Study of evolution of beaks and leg of birds

- To know the histology of Amphioxus and frog

B. Sc. II (SEM IV)

Subject- Advanced Genetics and Animal Ecology

CO

- Gain Mendelian and Non- Mendelian inheritance
- To understand theories of sex determination
- Understand Human Genetical Disorders
- Gain knowledge of Genetic Screening and prenatal diagnosis
- Gain knowledge of Abiotic and Biotic factor
- Understand different ecosystem and relationship between habit and ecological niche.

CO Practicals

- Recording of Mendelian Traits in Man Detection of Monohybrid and Dihybrid Cross
- To identify human Karyotype and Chromosomal photo slide.
- To record human genetically traits.
- To Estimate of DO, Salinity, PH, free CO2, Calcium, Carbonates, Bicarbonates.
- To Prepare field Report Food Web diagram and Identification of common animals

B. Sc. III (SEM V)

Subject- Animal Physiology and Economic Zoology

CO

- Describe the Structure of respiratory organ.
- Explain the physiology of respiration and respiratory pigment.
- Neurophysiologic control of respiration.
- Describe blood circulation and its types.
- Explain the structure and mechanism of heart.
- Describe blood groups, blood coagulation, and factors.
- Explain the types and structure of muscles.
- Describe the physiology of muscle contraction.
- Explain the structure and types of neuron.
- Describe the neurotransmitter, synapse and synaptic transmission.
- Explain the hormones and their physiological role.
- Describe the reproductive cycle and hormonal control of reproduction.
- Explain the osmoregulation in aquatic and terrestrial animals.
- Describe the beneficial and harmful insects.

- Present status of aquaculture in India and fresh water fish culture.

CO Practicals

- Detection of blood groups.
- Estimation of hemoglobin percentage
- .RBC and WBC count.
- Preparation of haemain crystals.
- Measurement of blood pressure.
- To demonstrate action of salivary amylase on starch.
- To detect nitrogenous waste product.
- To explain the life cycle of honey bee, lac insect and silk moth.
- To identify the histological slides of major organs of respiratory.
- Circulatory and nervous system.
- To know the locally available fishes.

B. Sc. III (SEM VI)

Subject- Molecular Biology and Biotechnology

CO

- To prove the genetic material by various experiment.
- Explain the chemical structure and types of DNA and RNA.
- Describe the semi-conservative replication of DNA.
- State the concept of genes.
- Describe the process of protein synthesis. Explain the gene regulation in *E. Coli.*
- Describe the theory, types and significance of mutation.
- Explain the DNA repair process.
- Describe the PCR and blotting technique.
- State the DNA finger printing.
- Explain the recombinant DNA technology and its practical application.
- Describe the immune system and its types.
- To state the humoral and cell mediated immunity.
- To know the ELIZA and RIA technique.

CO Practicals

- To state the scope and importance of Micro technique.
- To prepare he various fixative.
- To know the collection of various tissue.
- To prepare the alcoholic grades & Use and care of oven.
- To know the block making and trimming.
- Use and care of microtome & to prepare the various stains.
- To know the section cutting and staining technique.
- To know the camera Lucida and its use and drawings.
- To prepare the slide of mitochondria.
- To know the extraction of DNA.
- Explain the application of DNA finger printing

Vivekanand Science College, Vivekanand Nagar
Department of Chemistry
Course Outcome (CO)
Course Name: Chemistry I Semester
B. Sc. I (SEM I)

CO

- Different periodic properties of elements.
- Periodic trends of atomic and ionic radii, ionization energy, electron affinity and electonegativity.
- Definition of ionic Bonding, Factors Affecting on ionic bond formation. Born-Lande equation to calculate Lattice energy, Born Haber cycle to determine lattice energy. Solvation and salvation energy.
- S block elements and P block elements
- Inductive effect, electromeric effect, resonance effect, Hyperconjugation.
- Reactive intermediates Carbocations, Carbanions and free radicals.
- Aliphatic Hydrocarbons- Alkanes, Alkenes, Alkynes and Alkadienes
- Aromatic Hydrocarbons - structure of benzene, Reactivity of benzene and orientation of benzene.

- Thermodynamics Adiabatic and Isothermal process. Statement of First law of thermodynamics, Need of Second law of thermodynamics.
- Concept of entropy. Physical significance of entropy, entropy of fusion, sublimation, vaporization, transition and its calculation.
- Gaseous state - Postulates of Kinetic theory of gases, RMS, average and Most probable Velocity.
- Phase Rule - Statement of Phase rule, explanation of phase rule,
- Number of components and degree of freedom, Applications of Phase rule to water and Sulfur dioxide.

CO Practical

- Detection of Acidic and Basic radicals from given inorganic mixture.
- Preparation of acetamide, benzanilide, Phenyl azo- dye, tribromoaniline, benzoicacid.

B. Sc. I (SEM II)

Course Name:-Chemistry

CO

- Understand the concept of polarization and Fijians' rule with its application
- Describe the covalent bond and hybridization and its types. >
- Discuss the concept of acids and bases, classify hard and soft acids.
- Apply Parsons HSAB or SHAB principle to acids and buses. > Compare the study of p-block elements of group 16 and 17 with reference to different periodic properties.
- Interhalogen compounds, their structure and properties and introduction of Fluorocarbons.
- Study noble gases, compounds of noble gases with their structure and bonding
- Discuss non-aqueous solvent, water as Universal solvent with different parameters. Liquid ammonia as solvent with its merits and de-merits.

- Explain different methods of preparations of alkyl and aryl halides with different chemical reactions and comparison of reactivity. Benzyne intermediate mechanism.
- Study alcohols Methods of preparation, reactions & uses of dihydric alcohol.
- Pinacol-pinacolone re-arrangement mechanism.
- Co-relate and study phenols, ethers and Epoxides Their methods of preparation with specific name reactions-like Williamson's synthesis Fries-rearrangement, Kolbe's reaction Ring opening reaction of Epoxides
- Understand electrical and magnetic properties with their application
- Study the types of magnetic properties.
- Study Gouy's balance method. Application of magnetic moment for identification of molecular structure with different numerical
- Visualize and discuss the concept of chemical kinetics
- Study terms involved in it. Half-life period, order of reaction with examples. Determination of order of reaction using different methods like-vant-Hoff's method, Ostwald's method.
- Activation energy and Arrhenius equation with numerical

Co Practical's

- Systematic analysis of organic compound under following heads:
- Preliminary test, element detection, functional group, melting boiling
- Preparation of derivative with its melting point.
- Determination of surface tension by stalagmometer.
- Determination of coefficient of Viscosity of unknown liquid by Ostwald's Viscometer method.
- Comparison of cleaning power of detergents sample by stalagmometer
- Determination of parachor value of $-CH_2$-group by stalagmometer.
- Determination of heat of solution of KNO, solution.

B. Sc. II (SEM III)

Course Name:-Chemistry and Third semester

CO

- Molecular orbital theory, Concept of bond order, MO structure of homonuclear diatomic molecule, Comparison of VB and MO theory.
- Free electron theory & properties of metals, Resonance theory of metals
- Various rules under VSEPR theory to explain molecular geometry
- Volumetric analysis, Molarity, Normality, Types of acid & base titration
- General principles involved redox titration, lodometric estimation of Cu(II)
- Theoretical principles underlying various steps involved in gravimetric analysis, Estimation of barium as barium sulphate

- Preparation of acetaldehyde, benzaldehyde, acetone, acetophenone, structure of carbonyl group, reaction of aldehyde and ketones
- Structure and reactivity of carboxylic group, Preparation of oxalic acid, Lactic acid, Benzoic acid and their reaction.
- Element of symmetry, chirality, asymmetric carbon atom, enantiomers and diasteriomers.
- Cis-trans and E-Z nomenclature, Methods of structure determination.
- Bayer strain theory, stability of cycloalkanes, conformational isomers
- Gibbs and Helmholtzs free energy function, partial molal function, GibbsDuhem equation.
- Nerst distribution law and its applications, Phase transition-clausis clyperson equation.
- Surface tension and applications of surface tension, Viscosity and its applications
- Conductance of electrolyte solution. Conductometric titration and its application, Determination of dissociation constant of weak electrolyte.

CO Practical

- Experiments related to Volumetric Analysis such as neutralizing capacity of antacid, the strength of oxalic acid, FAS, K2Cr207, Percentage purity of FAS. Estimation of copper by lodometric titration
- Experiments related to Gravimetric analysis such as Estimation of Barium, Nickel, Iron.
- Physical chemistry experiments such as determine refractive index. consulate temperature for phenol water system, Transition temperature of MnC124H20, Kinetics of hydrolysis of methyl acetate, kinetics of saponification of ethyl acetate, determine partition coefficient of benzoic acid, Iodine, determine solubility of benzoic acid at different temperature and heat of solution.

B. Sc. II (SEM IV)

Course Name:-Chemistry and fourth semester

CO

- Know characteristics of transition elements, general properties of transition elements with special reference to group trend. Comparison of 3d series element with 4d and 5d series element
- Know principle involve and factors affection in extraction of elements, Apply thermodynamic concept to reduction process (Ellingham Diagram).
- special properties of lanthanides, Leam electronic configuration & oxidation state of Actinides, comparison of Lanthanides & Actinides
- Know general properties of metallurgy

- Know orbital picture, synthesis and reactions of naphthalene (Electrophillic Substitution), Preparation of Napthal and Napthalamine.
- Know synthesis and properties of malonic ester, Acetoacetic ester
- Know constitution, structure of glucose and fructose. Epimerization, Conversion of glucose to fructose.
- Know preparation of nitrobenzene, Reduction reaction of nitrobenzene basic and neutral medium.
- Know basicity of amine compounds. Preparation and properties of aniline, Hoffmann exhaustive methylation and its mechanism.
- Know preparation of benzene diazoniun chloride and its synthetic applications
- Know classification, synthesis and properties of proteins
- Describe colligative properties of dilute solutions with respect to elevation of boiling point, depression in freezing point, Explain abnormal behaviour of solution, Van't Hoff's fames i) Determination of degree of dissociation and association from Van't Hoff's factors and to solve the numerical
- Know type of symmetry, Laws of symmetry, Weiss and Miller indices of lattice planes Calculation. Bravais lattice of SCC. BCC, FCC, Bag's law, Method of determination of Orbital structure of NaCl and KCl and to solve the numerical.

Co Practical's

- Employ scientific knowledge for separation of binary mixture of Cu2+Practicals and Ni2+ ions by paper chromatography and determination of Rf value.
- Employ scientific knowledge for estimation of Zn2+ ion by complexometric titration.
- Employ scientific knowledge for determination of strength of unknown calcium salt solution by complexometric titration.
- Employ scientific knowledge for estimation of hardness of water by complexometric titration.
- Use modern technique for estimation of Cu2+ ion in CuSO4 sample solution by spectrophotometry

- Employ scientific knowledge and good laboratory practice for isolation of in from milk of casein from milk
- Employ scientific knowledge and good laboratory practice for estimation of glucose.
- Employ scientific knowledge and good laboratory practice for estimation of acetamide.
- Employ scientific knowledge for determination of equivalent weight of organic acid.

B. Sc. III (SEM V)

Course Name: - Chemistry semester fifth

CO

- After successfully completing this course, students will be able to know
- Basic terms involve in coordination chemistry. Werner's theory.
- Nomenclature and isomerism in coordination compounds, Structure and bonding in complexes of 3d series elements.
- Definition, classification and application of Chelates

- Crystal field theory, Crystal field splitting, concept of CFSE. High spin and low spin complexes
- Electronic spectra of transition metal complexes, Calculation of ground Orgel diagram of d) and 49 complexes, Electronic spectrum of [Ti (H20) 6]3+
- Stability of complexes. Thermodynamic and Kinetic stability.
- Orbital picture and substitution reaction of pyrrole and pyridine, Chemical reaction and orientation.
- Method of preparation and synthetic application of organo magnesium, organolithium and organo zinc compounds
- Retro synthetic analysis and applications.
- Polymers, Dyes, Drugs and Pesticides.
- Quantum mechanics, Plank quantum theory, Photoelectric effect, Compton effect, de Broglie hypothesis, Heisenberg's uncertainty principle
- Classical wave equation, Derivation of time independent Schrodinger wave equation, well behaved wave function.
- Application of Schrodinger wave equation, Concept of atomic orbital
- Molecular spectroscopy, Energy level diagram of molecule. Conditions and selection rules for rotational, vibrational and Raman spectrum.
- Pure rotational and vibrational Raman spectrum of diatomic molecule.

Co Practical's

- Preparation of tetraminecopper (II) sulphate, Hexamine nickel (II) chloride, potassium trioxalato aluminate (III), Prussian blue, chrome alum, sodium thiosulphate and dithionite, cuprous chloride
- Estimation of acetamide, glucose, formaldehyde, nitro group, protein.
- Qualitative separation of mixture of dyes using TLC Paper chromatography.
- Demonstration of Steam Distillation.
- Conductometric titration of mixture of strong and weak acid against a strong base

- Determination of Dissociation constant of weak acid condoctometry
- Potentiometric titration of strong acid against strong base
- Verification of Lambert Beer Law using $KMnO_4$/ $K_2Cr_2O_7$

B. Sc. III (SEM VI)

Course Name: - Chemistry semester sixth

CO

- Thermodynamic and kinetic stability of complexes and different factors affecting the stability of complexes
- Two types of substitution reactions shown by coordination compounds with their mechanisms viz. SNI dissociative mechanism and SN2 associative mechanism

- Labile and inert complexes and the various factors affecting the labiality of complexes
- Various regions of electromagnetic spectrum, phenomenon of coloration of complexes and laws of light absorption,
- Principle and applications of spectrometer, colorimeter and paper chromatography
- Metal carbonyls, Effective atomic numbers (EAN) rule, structure of metal carbonyls on the basis of VBT, concept of synergic bonding structure and bonding in silicon polymers, polyphosphazenes, role of bioinorganic molecules or trace elements in biological system
- Principle, instrumentation, solvent and application of electronic spectroscopy and IR spectroscopy compound elucidation of unknown organic compound
- Principle, instrumentation and application of IH-NMR spectroscopy and mass-spectrometry molecules structural elucidation of given organic molecule
- Introduction to elementary quantum mechanics involving Planck's quantum theory, Heisenberg's Uncertainty Principle, de Broglie hypothesis. Photoelectric effect, Compton's effect, Schrodinger wave equation, wave function and concept of atomic orbital’s.
- Principle and application of pH-metry using different electrodes and about Potentiometric titration
- Nuclear models, Meson theory, nuclear fission and nuclear fusion reactions. Q-value and application of radioisotopes for human welfare.

Co Practical

- Estimation of organic compounds like glycine, formaldehyde. ascorbic acid, phenol from the given solution skillfully
- Handling of instruments conductometer, potentiometer skillfully and performed practical’s by using this instruments.

Vivekanand Science College, Tq: Mehkar Dist: Buldana

DEPARTMENT OF MICROBIOLOGY

B. Sc - I (Semester - I)

Course Name: Fundamental of Microbiology and Microbial Physiology

After the completion of this course students should be able to

Co- 1:

- Get the knowledge of history of microbiology

Co- 2:

- Learn functions, low and high power objectives, oil immersion objectives

Co- 3:

- Understand bacterial classification

Co- 4:

- Knowledge of general characteristics of viruses, fungi, Actinomycetes

Co- 5:

- Understand structural organization of bacteria

B. Sc - I (Semester - II)

Course Name: Microbiology, Biochemistry, Biostatic and Computer

CO – 1 :

- To understand Discovery classification and various method of replication of viruses
- To understand various concept of virus cultivation.

CO – 2 :

- To learn the basic skill which one use in microbiology.
- To understand the mechanism of cell injury.
- To understand the physical chemical and chemotherapeutic agent that used for control of microorganisms.

CO – 3 :

- To understand the role of microorganisms in production of bio fertilizer and bio pesticides
- To understand the role of microorganisms in production of various vaccines and antibiotics
- to understand the role of microorganisms in the food chemical and pharmaceutical industry
- To understand the role of microorganisms in biodegradation and bioleaching

CO – 4 :

- To understand the structure and function of various biomolecules
- To understand the structure and function of nucleic acid i.e DNA and RNA

CO – 5 :

- To learn the basic concept of biostatics
- To understand various types of Central tendencies
- To learn the concept of correlation, linear regression, hypothesis testing
- To understand the models of data presentation

CO – 6 :

- To understand basic concept of computers and various computer components of computer system.

- To understand the memory concept.

B. Sc - II (Semester - III)

Course Name: Molecular Biology and Genetic Engineering

After completion of course students should be able to

CO – 1 :

- To understand the concept of gene.
- To understand replication of DNA and different models of replication.
- To understand mechanism of DNA repair.
- To understand the concept of genetic code.
- Understand the process of protein synthesis.

CO –2 :

- Learn the various operons models to understand gene regulation.
- Know the concept of mutation and its type.
- Understand various mutagenic agents and their effect.

CO –3 :

- To understand the mechanism of gene recombination in prokaryotic cell.
- To understand the processes of genetic material transformation in prokaryotes.

CO – 4 :

- To learn the basic technique of genetic engineering.
- To understand the use of various enzyme in genetic engineering.
- To learn the various vectors used in genetic engineering.

CO –5 :

- To learn the isolation method of DNA in bacteria.
- To learn the various methods like colony hybridization, Southern blotting, gene mapping, DNA sequencing and PCR.
- To understand the concept of gene library.

CO –6 :

- To understand the application of genetic engineering in healthcare biotechnology
- To understand the how transgenic plants are produced
- To learn how genetically engineered microbes used in pollution control
- To understand the application of genetic engineering in industrial biotechnology

B. Sc - II (Semester - IV)

Course Name: Medical Microbiology

After completion of this course student should be able to

CO –1 :

- To understand the concept of epidemiology.
- To understand the normal flora of human body.
- To learn the types of infection and transmission of disease.
- To understand how to control communicable disease.

CO –2 :

- To understand the concept of immunology, organs and cells involve in human system
- To learn the general nonspecific factors.
- To understand the types of immunity.
- To understand concept of hypersensitivity and immune response.

CO –3 :

- To understand antigen and its type of bacterial antigens.
- To understand antibody types and structure.
- To learn the antigen antibody reaction and its application in serological diagnosis of disease.

CO –4 :

- To learn the various pathogenic bacteria and their mode of transmission, epidemiology, treatment, lab diagnosis and prophylaxis.

CO –5 :

- Various viral disease their causative agent mode of transmission, epidemiology, treatment, laboratory diagnosis and prophylaxis.
- To learn various fungal and protozoal disease their causative agents, modes of transmission, epidemiology, treatment, lab diagnosis and prophylaxis.
- To learn rickettsial disease their causative agent mode of transmission, treatment, lab diagnosis and prophylaxis.

CO –6 :

- To understand chemotherapeutic agent.
- To understand the mode of action and uses of antibacterial agents antiviral agent and antifungal agents.
- To understand the various antimicrobial susceptibility test.

B. Sc. III (SEM V)

Environmental Microbiology and Bioinstrumentation

CO

- ❖ Understand microbial interactions present in natural habitat.
- ❖ Understand atmosphere and its composition.

- Understand different types of microbes present in Air.
- Understand about Air- borne disease Understand about how to control air borne disease.
- Understand presence of microorganisms in soil.
- Understand formation of process of humus
- Understand concept of biological Nitrogen fixation
- Understand different Biogeochemical cycling of elements.
- Understand Biofertilizer, its competition and its importance in Agriculture
- Microorganisms present in water, their growth requirements.
- Planktons and their importance.
- How to control problems created by planktons
- Concept of Eutrophication.
- Collect water sample from natural sources for testing.
- Perform bacteriological analysis of water.
- Know the indicators of excretal pollution of water.
- Perform Multiple Tube Dilution technique and Most Probable
- Number technique for testing water potability.
- Know the ICMR and WHO standards of drinking water quality.
- Self-purification of water.
- Treatment of water
- Construction of Slow Sand Filters and Rapid Sand Filters.
- Chlorination of water.
- Treatment of sewage
- Construction of Municipal Sewage treatment plant. Secondary treatment of sewage.
- Construction of Domestic Sewage treatment plant

- Concept of Chemical Oxygen Demand and Biological Oxygen Demand
- Construction of Biogas production plant. Understands Spectroscopy
- Understand Electrophoresis
- Understand Chromatography, its different types and its importance.
- Acquainted with concept of Isotopes and its use in Biological field.

CO Practical

- Perform bacteriological analysis of water by various methods
- Determine Biological Oxygen Demand of water.
- Estimate chlorine demand of water and residual chlorine from water.
- Enumerate microorganisms from soil.
- Isolate Azatobacter and Rhizobium from soil.
- Isolate antibiotic producing bacteria from soil.

B. Sc. III (SEM VI)

Course Name: - Industrial fermentation, food microbiology and metabolism

CO

- Industrial importance of microorganisms.
- Process of fermentation.
- Production strain.
- Scale-up process.
- Layout of fermentation plant.
- Raw materials used in fermentation.
- Antifoam agents used in fermentation process.
- Sterilization of fermentation medium
- Industrial production of Ethanol, Beer. Wine and Acetone-Butanol.
- Industrial Production of Baker's yeast, Single Cell Proteins.
- Industrial Production of Penicillin, Amylase, and Vitamin B12.
- Composition of milk.
- Sources of contamination of milk.
- Pasteurization.
- Testing of milk for its quality.
- Preparation of various milk products.
- Understand food spoilage.
- Understand how to preserve food.
- Know preparation of various fermented food products like Idli, Pickels, and Sauerkraut.
- Understand concept of food poisoning and food intoxication.
- Understand enzymes and its classification.
- Understand EMP pathway and TCA cycle of metabolism.
- Understand about Electron Transport Chain.

Co Practical

- Perform milk testing by Phosphatase & Methylene Blue Reduction test
- Enumerate bacteria in milk.
- Perform test for adulteration of milk
- Produce ethyl alcohol citric acid and amylase from raw material.
- Immobilize enzyme.
- Produce pickle and cheese.
- Produce wine from graphes and other raw material.

Department of Biotechnology

Course Outcome (CO)

B. Sc. I SEM - I

Course name: - Cell Biology and Biomolecules

After the completion of this course students will be able to-

CO

- Understand the evolution of cell and introduction to biotechnology
- Learn about biomolecules-I- carbohydrates and lipids
- Learn about biomolecules-II- Nucleic acid and proteins
- Idea about structure and function of cell organelles.
- Knowledge about cell transport and fractionation
- Scientific knowledge about cytoskeleton, cell division and stem cell.

B. Sc. I SEM - II

Course name: - Microbiology

After the completion of this course students will be able to

- Industrial Research field scope and importance of biotechnology
- General idea about microbial cell structure
- General idea about microbial metabolism.
- Important industrial useful microorganisms.
- Use for diagnosis pathological microorganisms.
- Handling the basic techniques in microbiology.

B. Sc. II SEM III

Course name - Essential Mathematics Biostatistics Bioinformatics and Biophysical method

After the completion of this course students should be able to:-

- Alia about essential math's limits of function, derivative, differentiation and integration.
- Knowledge about introduction to statistics.
- Useful industrial measures of Central tendency.
- Medicine sector use general biophysical methods and radioactivity.
- The idea about environment use thermodynamics as applied to biological system.
- The knowledge about biological information Bioinformatics introduction.
- Course name animal cell biotechnology

B. Sc. II SEM IV

Course name – Genetic Engineering and Microbial Biotechnology

After the completion of this course students will be able to :-

CO

- Information about life at molecular level. Molecular basis of life
- Knowledge about protein formation. Protein synthesis.
- Information about formation of new species gene cloning
- Use of biotechnology in medicine sector

Microbial biotechnology I- Medicine

- Use of biotechnology in Industrial sector

Microbial Biotechnology II- Industry

- Use of biotechnology in environment

Microbial biotechnology III- Environment

B. Sc. III SEM V

Course Name: - Animal Cell Biotechnology

After the completion of this course students will be able to :-

- Information about body structure.
- Major types of tissue, extracellular Matrix.
- History of development of cell culture.
- Information about internal structure of laboratory.
- Design and layout of the laboratory.
- Knowledge about how to prepare media.
- Detail information about animal tissue culture.
- Actual use application of animal cell culture.
- Specialized techniques handling in industry.

B. Sc. III SEM VI

Course Name: - Plant Biotechnology

After the completion of this course students will be able to :-

- Information about plant growth compound
- Information about plant growth hormones
- Detail information about plant tissue culture
- Learning about in vitro technology in plant tissue culture
- Understand single cell suspension culture
- The idea about hybridization

Somatic hybridization technique.