

Department of Chemistry

Sardar Patel Mahavidyalaya, Chandrapur

Programme Specific Outcomes and Course Outcomes

Under Graduate Programme In Chemistry

Programme Outcomes of the B. Sc. Chemistry programme

- 1) The Programme enables the students to understand basic facts and concepts in Chemistry while retaining the exciting aspects of Chemistry so as to develop interest in the study of chemistry as a discipline.
- 2) Attains the ability to apply the principles of Chemistry.
- 3) Gets approach to appreciate the achievements in Chemistry and to know the role of Chemistry in nature and in society.
- 4) Develops problem solving skills.
- 5) Gets familiarized with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to get apprised with its relevance in future studies.
- 6) Attains to some extent certain skills in the proper handling of apparatus and chemicals.
- 7) Get exposed to the some different processes used in industries and their applications.
- 8) The students will learn the important analytical and instrumental tools used for practicing chemistry.

Inorganic Chemistry

Attains interest in various branches of Inorganic chemistry. To impart essential theoretical knowledge on atomic structure, periodic properties, chemical bonding, and nuclear chemistry.

Students are able to understand the general characteristics of the s, p, d and f block elements. They get knowledge of the different theories to explain the bonding in

coordination compounds and the level of understanding of the chemistry of organometallic compounds, metal carbonyls and metal clusters.

Practical

Attains skills for quantitative estimation using the different branches of volumetric Analysis.

Students attains a thorough knowledge of Systematic qualitative analysis of mixtures containing two acid and two basic radicals with interfering radical by Semimicro method.

The students will get training in the quantitative analysis of metal ions and anions using gravimetric method.

Organic Chemistry

Becomes capable of understanding and studying nomenclature and classification of organic compounds, organic reactions .To have exposure to various emerging new areas of organic chemistry.

Attains elementary idea of chromatography, organic spectroscopy and photochemistry. Also able to identify organic compound using UV, IR and PMR spectroscopic techniques.

Practical

Becomes skilled for the qualitative analysis of organic compounds,determination of physical constants and Synthesis.

Students attain knowledge about the chemistry of some selected functional groups with a view to develop proper aptitude towards the study of organic compounds and their reactions. They are able to understand and study Organic reaction mechanisms.

Physical Chemistry

Students are able to understand the general characteristics of different states of matter. Gets knowledge about the intermolecular forces in gases and liquids, the structure of solids, Defects in solids.

Students are able to understand concepts of the fundamentals of quantum mechanics, distillation, solvent extraction, TLC and column chromatography and in quantitative dilution.

Students get an insight into the thermodynamic and kinetic aspects of chemical reactions and phase equilibria, to derive some thermochemical equations and kinetic equations. And study phase diagrams and elementary idea of catalysis.

To provide an insight into the characteristics of different types of solutions and electrochemical phenomena. To learn ionic equilibria and electrical properties of ions in solution. To learn the concepts of acids and bases, pH and buffer solutions.

Practicals

Students attains skill in doing experiments in kinetics, Potentiometry and phase rule.

Subject: Environmental Science

Program Specific Outcomes

- 1) Awareness among students about total environmental, problems associated with it and solutions through sustainable development concept
- 2) Thinking ethically about environmental and considering its every component important whether it is biotic and abiotic (think globally and at locally)

Name of Course: B.Sc (Environmental Science)

Semester I

Fundamentals of Environmental Science

1. Classification of clouds on the basis of their appearance.
2. Formation and structure of the earth with the help of composition of crust, mantle and core.
3. Differentiation of lotic and lentic ecosystem.
4. Examples of igneous, sedimentary and metamorphic rocks with their characteristics feature.

Ecology

1. Student will understand about fundamentals of ecology.
2. Various environmental factors and how they are affecting living organism.
3. Interaction among organism. Beneficial and harmful.
4. Meaning of population and characteristics of population.
5. Meaning of community and characteristics of community.
6. Community dynamics/ecological succession in an area.
7. Ecosystem its structure and function.
8. Types of ecosystem.
9. Bio-geochemical cycles, its types and examples.
10. Adaptation and its types. Adaptation In plants and animals.
11. Colour production process. Biological significance of colouration
12. Meaning of mimicry. Causes and evolution of mimicry.

Semester II

Elements of Environmental Science

1. Characteristics features of ocean water environment.
2. Significance of ozone layer
3. Reasons for global climate change and its effect on environment.
4. Need for formal and non formal environmental education in India.

5. Priorities in India in today's context.
6. Sustainable development and its today's importance

Applied Ecology

1. Natural services provided by environment with special emphasis on food and atmospheric services.
2. Contribution of ecological engineering in wastewater treatment and solid waste management.
3. Ecological applications in environmental management.
4. Forest and wildlife management by using principles of applied ecology.

Semester III

Pollution Science

1. Air pollutants, air pollution and various sources of air pollution.
2. Different problems due to air pollution such as acid rain, photochemical smog.
3. Various types of air pollutants emitted by industries viz. thermal power plant, coal mining and cement industry.
4. Water pollution, sources and effects of water pollution.
5. Process of thermal pollution, effects of thermal pollution on environment. Coal ash as a problem.
6. Physical pollution. Noise pollution-its sources and effects on human being.
7. Measurement of noise at various locations.
8. Types of radiation. Sources of radiation.
9. Radiation emitted by Cell phone and mobile towers.
10. Hazards in various industries. Problems associated with these hazards.
11. Soil pollution-its causes and sources.
12. Pesticide pollution. Bioaccumulation and biomagnifications.
13. Acidification and salination of soil.

Natural Resources and GIS

1. Renewable and non renewable energy resources with examples and need of their conservation
2. Concept of rain water harvesting and water management
3. Natural catastrophes and their effects with mega disasters of India.
4. Concept of remote sensing and its role in environmental management.

Semester IV

Forest and Wildlife

1. Role of forest and reasons for forest destruction.
2. Forest protection and conservation by implementing regulatory measures
3. Concept of wildlife and current status of wildlife in India.

4. Wildlife conservation by ex-situ and in-situ measures.
5. Role of international, national and grassroots level in environmental protection and conservation.

Pollution Control Technologies

1. Industrial and zoning criteria as a method for air pollution control.
2. Control devices for Particulates viz. ESP, Bag house filter etc.
3. Control devices for gaseous viz. adsorption, absorption, condensation and combustion.
4. Flue gas desulfurization and NO_x removal.
5. Impurities in water contributing to its pollution and their removal.
6. Thermal pollution control technologies viz. Cleaner technologies, cooling tower, cooling ponds.
7. Oil pollution control by nutrient enrichment and genetically engineered microorganisms.
8. Advanced methods for water pollution remedial technologies.
9. Noise pollution control at source, along the sound both and at receiver end.
10. Methods to control radioactive waste.
11. Minimization of X-ray hazard.
12. Occupational health plant. Its objectives and first aid.
13. Personal safety in an industry.
14. In-situ methods for soil pollution control.
15. Chemical and biological methods for pesticide pollution control.
16. Phyto remediation and bio-remediation along with conventional methods for pesticides pollution control.

Semester V

Environmental Engineering

1. Object of air, water, noise, soil, and solid waste sampling
2. Methods of soil and solid waste sampling
3. Principles of analytical methods in environmental analysis
4. Principles, components and applications of U.V. Visible spectrophotometer, AAS and GC.
5. Concept of corporate social responsibility.

Environment and Innovation

1. Innovations in environment waves of innovation.
2. Barriers and drivers of eco-innovation.
3. Types and level of eco-innovation.
4. Innovation system and its aspects.
5. Sustainable innovations with emphasis on physical, chemical and biological.
6. Environmental innovation w.r.t. agriculture and food, forestry, biodiversity, water and energy.
7. Contribution of education in innovation.

Semester VI

Environmental Management

1. Contribution of cleaner technologies, environmental economics and environmental management system in environmental management.
2. Role of EIA in environmental management.
3. Solid and Hazardous waste management.
4. Methods for industrial wastewater treatment with emphasis on primary, secondary and advanced methods.

Environmental Restoration

1. Concept and necessity of eco-restoration
2. Role of government agencies and NGOs in conservation and restoration
3. Importance of indigenous Knowledge of restoration.
4. Eco- restoration by plants that is phyto remediation.

Programme Specific Outcome of B.Sc., Mathematics

- I. Think in a logical and critical manner.
- II. Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
- III. Formulate and develop real life Mathematical problems in a logical manner.
- IV. Acquire good knowledge and understanding in advanced areas of Mathematics, chosen by the student from the given courses.
- V. To understand, formulate and use quantitative models arising in social science, Engineering, Transportation, Artificial Intelligence, Queuing Models, Relativity theory, Assignment Problems, Inventory Management System and other contexts.
- VI. Apply their broad knowledge of science across a range of fields, with in-depth knowledge in at least one area of study, while demonstrating an understanding of the local and global contexts in which science is practiced.

Course Outcome of B. Sc. Mathematics

(1) Course Outcome of Differential Calculus and Integral Calculus :-

Students will able to

- I. Solve Limits and Continuity by using ε and δ Definition.
- II. To understand types of discontinuities.
- III. Apply Theorems on limit and Continuity.
- IV. Solve problems on differentiability.
- V. Understand Successive differentiation and solve problems by using Leibniz theorem.
- VI. Apply Mean Value theorem(MVT), Rolle's Theorem and Cauchy's Mean Value theorem(CMVT).
- VII. Solve Problems on Taylors Series and Maclaurin's Series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$.
- VIII. Illustrate Improper integral, Gamma function and its properties.
- IX. Beta function and its properties of Beta functions.
- X. Derive relation between Beta and Gamma functions.
- XI. Evaluate integrals by using Beta and Gamma functions.
- XII. Understand Indeterminate forms .
- XIII. Apply L'Hospital rule to solve the problems of indeterminate forms.
- XIV. Evaluate double integrals.
- XV. Apply change variable method to find the value of double integral.

(2) Course Outcome of Differential Calculus and Trigonometry:-

Students will able to

- I. Understand the Limit and Continuity for function of two variables.
- II. Understand Maxima and Minima of function of two variables.
- III. Lagrange's Multiplier method .
- IV. Explain subtangent and subnormal.
- V. Find angle of intersection of two curves.
- VI. Find circle, radius and centre of curvature.

- VII. De Moivre's theorem and its applications.
- VIII. Expand $\cos^n \theta$, $\sin^n \theta$ and $\tan^n \theta$ in terms of θ .
- IX. Define hyperbolic functions and inverse hyperbolic functions.

(3) Course Outcome of Differential Equations and Difference Equations:-

Students will able to

- I. Understand First order Exact Differential Equation.
- II. Illustrate order and degree of Differential Equations.
- III. Extract the solution of differential equations of the first order and of the first degree by variables separable, Homogeneous and Non-Homogeneous methods.
- IV. Understand Linear differential equations and solve problems on Bernoulli's equations.
- V. Find a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for p , x and y .
- VI. Compute complementary function and particular integral of differential equations..
- VII. Compute all the solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.
- VIII. Solve simultaneous linear equations with constant coefficients and total differential equations.
- IX. Formulate Difference equation and solve problems.

(4) Course Outcome of Partial Differential Equations:-

Students will able to

- I. Formation of partial differential equations.
- II. Solve linear partial differential equation of first order.
- III. Illustrate Lagrange's linear differential equations.
- IV. Find the solution of First order partial differential equations for some standard types.
- V. Homogeneous partial differential equations and its applications.
- VI. Solve problems by using Jacobbi's method.
- VII. Non-Homogeneous differential equations.

(5) Course Outcome of Real Analysis:-

Students will able to

- I. Define different types of real sequence, bounded sequence, Cauchy Sequence.
- II. Discuss the behavior of the geometric sequence.
- III. Verify the given sequence in convergent and divergent by using behavior of Monotonic sequence.
- IV. Prove Cauchy's theorems on limits.
- V. Give examples for convergence, divergence and oscillating series.
- VI. Discuss the behavior of the geometric series.

- VII. Verify the given series is convergent or divergent by using different test.
- VIII. Define and recognize the concept of metric spaces, open sets, closed sets,
- IX. limit points, interior point.
- X. Define and Illustrate the concept Riemann Integrals.
- XI. Determine fundamental theorem on calculus and MVT of integral Calculus.

(6)Course Outcome of Set Theory and Laplace Transform:-

Students will able to

- a. Understand set theory.
- b. Determine Countable and uncountable sets
- c. Define fuzzy sets, α -cuts, fuzzy complements.
- d. Discuss types of operations on fuzzy sets, t-norms, fuzzy arithmetic.
- e. Explain extension principle of fuzzy sets, fuzzy numbers.
- f. Illustrate fuzzy relations, binary fuzzy relations, fuzzy equivalence relations.
- g. State some applications of fuzzy sets.
- h. Understand Laplace transform and Inverse Laplace transform.
- i. Apply Laplace transform to solve differential equations
- j. Use inverse Laplace transform to return familiar functions
- k. Apply Laplace transform to solve ODE and PDE.

(7)Course Outcome of Algebra:-

Students will able to

- a. Define Group ,subgroup, center, Normalizer of a subgroup.
- b. Find cycles and transpositions of a given permutations.
- c. Prove Lagrange's theorem .
- d. Define cyclic groups .
- e. Define normal subgroups , quotient groups and index of a subgroup.
- f. Define homomorphism ,kernel of a homomorphism, isomorphism.
- g. Prove Cayley's theorem , the fundamental theorem of homomorphism for groups.
- h. Define rings , zero divisors of a ring , integral domain , field and prove theorem.

(8)Course Outcome of Elementary Number Theory:-

Students will able to

- I. Illustrate Divisibility, Division and Euclidean Algorithm.
- II. Solve the problems of GCD and LCM.
- III. Describe the properties of prime numbers.
- IV. Define congruence's and describe the properties of congruence's.
- V. Solve the system of linear congruence's.
- VI. Solve Diophantine equations.
- VII. State Chinese Remainder Theorem, Fermat's and Wilson's theorem and Goldbach Conjecture.
- VIII. Describe Arithmetic function, Euler's theorem, Mobius μ function, τ and σ function.
- IX. Illustrate Pythagorean triplets.

(9)Course Outcome of Linear Algebra :-

Students will able to

- I. Define Vector Space, Quotient space Direct sum, linear span and linear independence, basis and inner product.
- II. Discuss the linear transformations, rank, nullity.
- III. Illustrate Dual Space, Bi dual space and natural Isomorphism.
- IV. Find the characteristic equation, eigen values and eigen vectors of a matrix.
- V. Prove Schwartz inequality, Gram-Schmidt orthogonalisation process.

(10)Course Outcome of Mechnics :-

Students will able to

- I. Define Kinematics in two dimensions.
- II. Define Simple Harmonic Motion and find its Geometrical representation.
- III. Illustrate coordinate systems, radial and transverse velocity and acceleration.
- IV. Find the Composition of SHM and the differential equation of a central orbit.
- V. Find the law of force if the orbit is given and vice versa.

(11)Course Outcome of Matrices and Theory of Equations :-

Students will able to

- I. Illustrate Symmetric and Skew symmetric, Hermitian and Skew Hermitian Matrices.
- II. Understand elementary operations on matrices.
- III. Learn Linear equations and various methods to solve linear equations.
- IV. Define characteristic equation of matrices and illustrate.
- V. State Cayley Hamilton Theorem and its applications.
- VI. Compute inverse of a matrix using Cayley – Hamilton Theorem.
- VII. Find Eigen values and Eigen vectors of a given matrix.
- VIII. Describe the relation between roots and coefficients
- IX. Find the sum of the power of the roots of an equation using Newton's Method.
- X. Transform the equation through roots multiplied by a given number, increase the roots, decrease the roots, removal of terms.
- XI. Solve the reciprocal equations.
- XII. Analyse the location and describe the nature of the roots of an equation.

(12)Course Outcome of Numerical Methods:-

Students will able to

- I. Define Basic concepts of operators Δ, E, ∇
- II. Find the difference of polynomial
- III. Solve problems using Newton forward formula and Newton backward formula.
- IV. Derive Gauss's formula and Stirling formula using Newton forward formula and Newton backward formula.
- V. Find maxima and minima for differential difference equation
- VI. Derive Simpson's $1/3, 3/8$ rules using trapezoidal rule
- VII. Find the solution of the first order and second order equation with constant coefficient
- VIII. Find the summation of series finite difference techniques
- IX. Find the solution of ordinary differential equation of first by Euler, Taylor and Runge-Kutta methods.

(13) Course Outcome of Complex Analysis and Vector Calculus :-

Students will able to

- a. Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers.
- b. Calculate exponentials and integral powers of complex numbers.
- c. Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations.
- d. Determine whether a given function is analytic.
- e. Define Bilinear transformation, cross ratio, fixed point.
- f. Write the bilinear transformation which maps real line to real line, unit circle to unit circle, real line to unit circle.
- g. Use Cauchy's integral theorem and formula to compute line integrals.
- h. Represent functions as Taylor, power and Laurent series.
- i. Classify singularities and poles.
- j. Find residues and evaluate complex integrals, real integrals using the residue theorem.
- k. Understand Vector Differentiation .
- l. Find and interpret the gradient curl, divergence for a function at a given point.
- m. Interpret line, surface and volume integrals
- n. Evaluate integrals by using Green's Theorem, Stokes theorem, Gauss's Theorem

(14) Course Outcome of Linear Programmig and Transportation Problem :-

Students will able to

- a. Define nature and feature of Operations Research.
- b. Formulate LPP by graphical method and its applications.
- c. Define basic feasible solutions, Slack and Surplus variable.

- d. Explain simplex method.
- e. Demonstrate Big-M method
- f. Illustrate two phase method
- g. Prove dual of the dual is primal.
- h. Interpret dual simplex method.
- i. Define transportation problem.
- j. Find a basic feasible solution to the transportation problem by using North west corner rule, Vogel's approximation method.
- k. Apply NWCR, LCM and Vogel's method to solve transportation problem.
- l. Illustrate Assignment problem, Travelling salesman problem and applications.

Department of Physics
Sardar Patel College, Chandrapur

Programme Outcome, Programme Specific Outcome and Course Outcome

Physics Programme outcome:-

PO1: Students get knowledge on universe from smallest to largest scale: it is about unraveling it's complexities to discover the way it is and how it works.

PO2: Students get skill on instrumentations which are used in medical imaging, nanotechnology and quantum computing.

PO3: Gaining the knowledge of basic laws in physics i.e. newton's laws, conservation laws, thermodynamics laws and its application.

PO4: Students understand the value of mathematics on fundamental concepts such as statistical physics, relativity.

PO5: Understanding of wave behavior and acoustic.

PO6: Gaining the knowledge of applied physics such as laser, thermal physics, nuclear physics, solid state physics which will be useful for formation of industries and energy productions.

PO7: Understanding the contribution of physics to solving global problem such as energy production, environmental protection, global warming and public health.

PO8: It develops interest in construction of acoustic of hall, circuits, instruments and research activities.

Programme Specific Outcomes

PSO1: Understand the nature and basic laws of physics mechanics, thermodynamics, relativity, optics, statistical physics, nuclear physics and applied physics.

PSO2: Understand the application of energy production, instrumentation and medical application.

PSO3: Perform laboratory work according to curriculum designed and develop skill in practicals and handling of instruments.

PSO4: Application of knowledge in various fields particularly for solving global problem, energy production and environmental production.

PSO5: Obtaining the knowledge about electrical and electronics skill which used in daily life.

COURSE OUTCOME

MECHANICS AND GRAVITATION

CO1: Study basic laws of mechanics, newton's laws and conservation laws.

CO2: Understanding the relation in to frame of reference in relativity.

CO3: Imparting the knowledge of gravitation, oscillation and properties of matter

VECTOR ANALYSIS, ELECTROSTATICS AND MAGNETOSTATICS

CO1: Imparting the knowledge of vector calculus and its application.

CO2: Understanding the Maxwell's equations and electromagnetic wave.

THERMAL AND STATISTICAL PHYSICS

CO1: Understanding the basic laws of thermodynamics and Carnot's cycle.

CO2: Study the Maxwell's equation of thermodynamics and its application.

CO3: Imparting the knowledge about Maxwell Boltzmann statistics, Boltzmann statistic and Fermi Dirac statistic.

CO4: Study the black body radiation spectrum.

WAVE ACOUSTIC AND OPTICAL PHYSICS

CO1: Understanding the nature of wave and acoustic of Hall.

CO2: Study the basic concepts of optical physics.

MODERN PHYSICS AND SOLID STATE PHYSICS

CO1: Understanding the dual nature of light and application of Schrodinger wave equation.

CO2: Study the nature of nuclear reaction, nuclear reactor and nuclear detectors.

CO3: Imparting the knowledge of crystal structure and properties of matter.

NUCLEAR AND PARTICLE PHYSICS AND DIGITAL AND ANALOG CIRCUITS

CO1: Study the elementary particles, Quark structure and Leptons.

CO2: Imparting the knowledge about digital and analog circuits, adder, subtractor, multivibrators, power supply and operational amplifiers.

Department of Zoology
Sardar Patel College, Chandrapur

Programme Outcome , Programme Specific Outcomes and Course Outcomes

Zoology Programme Outcome:-

- PO1: Students get knowledge and skill on the fundamentals of Animal sciences.
- PO2: Understand and analyse complex interactions among various living organisms.
- PO3: Gaining the knowledge of basic unit of life i.e. cell, its internal structure ,it's functions and its role in managing various metabolic function of organisms
- PO4: Understanding of Animal behavior and evolutionary process, adaptive radiations in animals.
- PO5: Understanding various concepts of genetics and its role in human health.
- PO6: Gaining knowledge of applied Zoology such as Apiculture, Sericulture fish farming which. will be useful for formation of small scale industries or self employment in future.
- PO7: Understanding of environmental conservation processes, Pollution causes, Biodiversity.
- PO8: Application of knowledge of Zoology to one's own life.
- PO9: Develops empathy and love towards nature and animals.

Programme Specific Outcomes

- PSO1: Understand the nature and basic concepts of cell biology, genetics, taxonomy, ecology Applied Zoology etc.
- PSO2: Understand the applications of biological sciences in Medicine ,Entomology, Fishery Science, Biodiversity Conservation.
- PSO3: Perform Laboratory work according to curriculum designed and develop skill in practicals, development of skill of team work.
- PSO4: Obtaining the knowledge about research methodologies.

PSO5: Application of knowledge in various branches of Zoology particularly for Biodiversity and its conservation.

Course Outcome

Animal Diversity (Invertebrate & Vertebrate)

CO 1: Understanding general taxonomic rules for classification of Animals.

CO 2: Imparting knowledge of all animal phyla, their systems, adaptations and their association with environments.

CO 3: Stating the importance of each animal in ecosystem and food chain.

Cell Biology, Genetics and Evolution

CO 1: Structural and functional aspects of basic unit of life.

CO2: Imparting knowledge of evolution process.

Physiology and Biochemistry

CO1: Imparting the knowledge about the physiological and biochemical processes in Animal body giving emphasis on human physiology

CO2:: Interaction and interdependence of physiological processes.

Developmental Biology

CO1: Understanding the process of reproduction, fertilization and development of embryo upto adult.

CO2: Basic concepts of developmental biology.

Applied Zoology

CO1: Imparting the theoretical knowledge of Sericulture, Apiculture, fish farming as well as practically, from the professional point of view.

CO2: Understanding the basic concepts of life cycle of beneficial animals their products, Management and their pathology.

Environmental Biology

CO1: Imparting knowledge regarding the environment and its conservation.

CO2: Study of types of ecosystem.

CO3: Study of various types of pollutions and controlling measures.

Faculty of Commerce

PSOs of COMMERCE

1. Students has know the modern trends in Marketing and has got basic knowledge in Marketing
2. Students has got the basic Concept and Principles of Marketing-
3. Students has aware about recent trends in Marketing and their Application
4. Students has got the basic micro economics concepts and Application.
5. Applying economic analysis in the formulation of business policies.
6. Using economic reasoning problems of Business.
7. Students has getting the emerging issues in business, trade and commerce regarding recording, maintaining and presenting the accounting and financial facts.
8. Understanding of the concepts of Human Resource Development gain and insight of the factors which go into the making of an efficient HRD Manager
9. Providing and getting depth knowledge on various aspect of Banking system and Insurance.
10. Awareness among the Students about the careers in the field of Banking and Insurance.
11. Adopted the basic knowledge and understanding of important Statistical tools and Statistics and Mathematics elementary application to Business.
12. Getting basic Accounting knowledge as applicable to Business.
13. Getting awareness about the basics of Business Communication.
14. Skills about drafting notices, resolutions, minutes, reports, etc
15. Developing conceptual understanding of the fundamentals of Secretarial Practice and procedure requirements.

PSOs of Economics

- ❖ Understand the maximum Satisfaction in minimum Income through Law of Equi- Marginal Utility Analysis
- ❖ Statistical analysis of any event
- ❖ Understand the Market Structure
- ❖ Understand the Index number
- ❖ Understand the Economical planning of individual, Family, State and National Level
- ❖ Understand the Agricultural Planning
- ❖ Understand the Indian Economy
- ❖ Understand the Inflation, Deflation and their Economic effects
- ❖ Development of Vision of any Event

PROGRAMME OUTCOMES OF ENGLISH

Students will be able to

- enhance the listening and communicative abilities.
- develop the writing skills.
- broaden the knowledge of English language.
- become self- expressive
- use proper English language and appropriate expressions.
- understand the importance and utility of English language.
- prepare themselves to deal with soft skills.
- get familiarized with various pieces of prose and poetry in English.
- understand cultural experiences and situations and develop human values and social awareness.
- perceive the literary merit, beauty and creative use of language.

Sardar Patel Mahavidhyalaya, Chandrapur
Department of History
History Outcomes

- 1) इतिहास लेखनशास्त्राची माहिती प्राप्त होते.
- 2) इतिहासातील कालक्रमबद्धता व नियतकालाची माहिती मिळते.
- 3) भूतकाल व वर्तमान काळाची सांगड घालता येते.
- 4) जागतिक इतिहासाशी भारताच्या इतिहासाची तुलना करता येते.
- 5) इतिहासाचे टिकात्मक अध्ययन करता येते.
- 6) भारतीय संस्कृतीतील विविध धर्माची माहिती मिळते.
- 7) राष्ट्रीय एकात्मता वाढते.
- 8) भारताच्या गौरवशाली इतिहासाची माहिती मिळाल्यामुळे राष्ट्रप्रेमाची भावना निर्माण होते.
- 9) भारतात विविधता का निर्माण झाली याची माहिती मिळते.
- 10) विविध स्पर्धा परीक्षांची तयारी होते.

Programme outcome of Marathi

- १.विद्यार्थ्यांमध्ये नैतिक मूल्यांची वाढ होईल.
- २.विद्यार्थी लोकांमध्ये वागताना त्यांचे वर्तन विवेकाचे असेल.
- ३.विद्यार्थ्यांमध्ये कलामूल्यांचे भान निर्माण होईल.
- ४.विद्यार्थ्यांमध्ये अस्मितेची जाणीव निर्माण होईल.
- ५.विद्यार्थ्यांमध्ये वैज्ञानिक दृष्टीकोण निर्माण होऊन त्यांच्या वर्तनात तसा बदल जाणवेल.
- ६.विद्यार्थ्यांमध्ये सामाजिक आस्था निर्माण होऊन सामाजिक सहभाग वाढेल.
- ७.विद्यार्थ्यांमध्ये सांस्कृतिक नेतृत्व येईल.
- ८.विद्यार्थ्यांमध्ये वैचारिक प्रगल्भता येईल.
- ९.काव्य,नाट्य,लोककला,लोकरंगभूमी यांविषयी आस्था वाढेल.
- १०.विविध कलाक्षेत्रातील सहभाग वाढेल.
- ११.लेखनकौशल्य वाढून पत्रलेखन,साहित्य लेखन विकसित होईल.
- १२.विद्यार्थी भाषांतर विद्या मिळवतील.
- १३.वाचन कौशल्य वाढून पत्रकारिता,आकाशवाणी,दूरदर्शन या क्षेत्रात जातील.
- १४.विद्यार्थ्यांमध्ये संशोधकवृत्ती वाढेल.
१५. विद्यार्थ्यांना व्यावहारिक ज्ञान येईल.
१६. समाजप्रेम आणि देशप्रेम वाढेल.
१७. शिक्षणाचं महत्त्व समजून शिक्षणविषयक जनजागृती करतील.
- १८.लोकशाही विषयक जनजागृती करतील.
१९. भाषेचा योग्य वापर व्यवसायाच्या क्षेत्रात करतील.
- २०.मराठी भाषाविषयक आस्था लोकांमध्ये वाढवतील.मराठी भाषा जिवंत ठेवण्यासाठी प्रयत्न करतील.

Department of Sociology

Sociology Outcomes

1. समाजातील सामाजिक समस्येच्या निर्मूलनात मदत
2. वाईट प्रथा-परंपरा विषयी जाणीव जागृती
3. जात , धर्म, लिंग ,वंश या विषयीचा पूर्वग्रहदूषित दृष्टिकोन कमी करण्यासाठी.
4. सामाजिक परिवर्तनाची दिशा ठरविण्यासाठी
5. पर्यावरणीय प्रदूषणाविषयी जनजागृती
6. सामाजिक जाणिवांचा विकास
7. संशोधन वृत्तीची निर्मिती
8. वैज्ञानिक दृष्टिकोनाचा विकास
9. राष्ट्रीय एकात्मता निर्माण करण्यास मदत
10. व्यक्तिमत्व विकासासाठी चालना
11. दुर्बल घटकाच्या कल्याणा विषयीच्या दृष्टीकोनाचा विकास
12. चिरंतन विकासाचा दृष्टीकोण

Sardar Patel Mahavidyalaya Chandrapur

Department of Mathematics

M.Sc. Mathematics

(2 years program)

PROGRAMME OUTCOMES (PO):

After the completion of the program, students will be able to:

PO1: Pursue research in reputed institutions and solve the existing mathematical problems using the knowledge of pure and applied mathematics.

PO2: Acquire the strong foundation of basic concepts which will benefit them to become good academicians.

PO3: Apply the concept of mathematical tools to address real life problems

PO4: Gain the knowledge of software which will be useful in Industry

PO5: Qualify various competitive exams like CSIR-UGC NET, SET, GATE, MPSC, UPSC, etc

M.Sc. Mathematics Programme: Course objectives and outcomes
Semester -I

| Cours e code | Course Name | Course Objectives | Course Outcomes (CO) |
|---------------------|---------------------------|--|--|
| PSCMTH01 | Group Theory& Ring Theory | To introduce the concepts and to develop working knowledge on Groups and Rings, so that strong foundation for subsequent algebra courses can be developed. | CO1: Verify Groups and Rings properties. CO2: Decide whether given two groups are isomorphic or not. CO3: Understand solvability of groups. CO4: Gain command over Sylow theorems and thereby simplicity of groups. CO5: |
| PSCMTH02 | Real Analysis | To learn the concepts of basic topological objects such as open sets, closed sets, compact sets and the concept of sequence of functions. | CO1: Attain mastery in Archimedean property, LUB axioms, and Sequence of real numbers CO2: Acquire the knowledge of Open, closed, and connected sets and continuous functions CO3: Study Compact metric space , Uniform Continuity, Continuous functions on Compact domains CO4: Study in detail sequence of functions. |
| PSC MTH 03 | Topology | The goal of the course is to provide in depth knowledge of this fundamental core course in mathematics to show various techniques from analysis , set theory. | CO1: Understand basics of Topological Spaces CO2: Study Connected Spaces, Limit Point Compactness, Local Compactness. CO3: T_0 - and T_1 -Spaces, T_2 -Spaces and sequences, Countable Axioms, Separable, Regular and Normal Spaces. |
| PSC MTH 04 | Linear Algebra | This course is aimed to provide an introduction to the theories, concepts and to develop working knowledge of vector spaces, linear transformations and canonical forms. | CO1: Assimilate the concept of linear dependence, basis etc. CO2: Analyse properties of linear transformations, their matrices etc. CO3: Study eigen value, eigen vectors of linear transformation. CO4: Understand geometric properties via study of inner product spaces. Develop knowledge of canonical forms. |

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| PSC MTH 05(a) | Numerical Analysis | Numerical Analysis deals with numerical solutions of certain problems of Mathematics. This course aims to study iterative methods to solve nonlinear equations in one variable, methods to solve system of equations, interpolation problems and Numerical solutions of differential equations. | CO1: Obtain the solutions of Transcendental and Polynomial Equations. CO2: Find solutions of system of equations using direct methods and Iteration methods CO3: Attain mastery to solve problems using interpolation. CO4: Acquire knowledge of Numerical methods to find solution of Ordinary Differential Equations |
| PSC MTH 05(b) | Ordinary Differential Equations | The aim of the course is to introduce various methods to solve first order differential equations. Also to study qualitative properties such as existence and uniqueness of their solutions. | CO1: Solve first order differential equations. CO2: Understand Solution of the Homogeneous equations and Non-Homogeneous equation. CO3: Study existence and uniqueness of solutions CO4: Analyse system of differential equations |
| PSC MTH05(c) | Calculus of Variations | This course is aim to provide an all types of simple variational problems. Derivation of the basic formula. | CO1: Explain all simple variational problem, Fixed end point problem. CO2: Functional depending on higher order derivative, Variational problems. CO3: The Weierstrass Erdmann conditions. CO4: Study of Canonical Transformations, Noether's Theorem, Principle of least action. |
| PSC MTH05(d) | Number Theory | The aim of the course is to study the Techniques of Numerical Calculation, Greatest Integer Functions, Arithmetic Functions. | CO1: Solutions of Congruence, Public-Key Cryptography. CO2: Study on Prime Modulus. CO3: Greatest Integer Functions. CO4: Explain Mobius Inversion Formula and simultaneous linear equations. |
| PSCMT H 05(e) | Fuzzy Mathemati cs-I | This course is aimed to study sets to Fuzzy Sets, Crisp sets. | CO1: Study on Fuzzy sets CO2: Fuzzy Arithmetic CO3: Fuzzy Relations CO4: Fuzzy Relation Equation |

M.Sc. (Maths)
Semester-II

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| PSCMT H06 | Field Theory | To introduce the concepts and to develop working knowledge on Field, Algebraically closed Fields. | CO1: Study on Unique Factorization domains. CO2: Splitting Fields, Normal Extensions. CO3: Explain Automorphism Groups and Fixed Fields CO4: Study the Fundamental Theorems of Algebra |
| PSCMT H07 | Lebesgue Measure Theory | In this course we study the Introduction on Measurable sets and Lebesgue measure. | CO1: Study the topic on measurable sets and Lebesgue measure. CO2: Explain the Riemann integral, Lebesgue integral of a bounded function. CO3: Differentiation of monotone functions, convex functions. CO4: Understand the topic on L^p - Spaces. |
| PSC MTH 08 | Advanced Topics in Topology | The goal of the course is to provide in depth knowledge of Topological spaces and Topological properties. | CO1: Study the topological spaces and Topological properties. CO2: Study of Tichonov topology and Tichonov theorem. CO3: Study of Paracompact spaces. |
| PSCMT H09 | Classical Mechanics | To demonstrate knowledge and understanding of the fundamental concepts in the dynamics of system of particles and motion of rigid body. Also learn to represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics. | CO1: Learn D'Alembert's principle and formulate Lagrange's equation of motion CO2: Understand Calculus of variation and solve different problems CO3: Formulate Hamiltonian equation and understand its physical significance CO4: Gain knowledge of Eulerian angles and Canonical Transformations. |
| PSC MTH 10(a) | Differential Geometry | In this course we study the properties of a surface. | CO1: Explain the first Fundamental form and Local Intrinsic Properties of a Surface. CO2: Study of Geodesics on a surface. CO3: The Fundamental Equations of Surface Theory. |
| PSC MTH 10(b) | Coding Theory | This course is aimed to provide an introduction to the theories, concepts of linear codes and their parameters. It also focuses on encoding and decoding techniques of linear codes. | CO1: Understand the concept of encoding and decoding. CO2: Explain various bounds on linear codes. CO3: Understand various tools to obtain new linear codes out of old ones. CO4: Study BCH codes and their parameters. |
| PSCMT H10(c) | Cryptography | To introduce the concepts and to develop working knowledge of encryption, decryption and cryptanalysis. | CO1: Understand the main essence of how cryptography helps to achieve common security goals. CO2: Analyse the notions of public-key cryptography, Study different primality tests |

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| PSCMT H10(d) | SCILAB Programming | To Introduce the concept of SCILAB Environment, programming in SCILAB. | CO1: Understand the Introduction on SCILAB. CO2: String Handling functions, Statistics. |
| PSCMT H 10(e) | Fuzzy Mathematics-II | This course is aimed to study Fuzzy Logic and Approximate reasoning. | CO1: Study on Fuzzy Logic. CO2: Constructing Fuzzy sets and operations on Fuzzy sets. CO3: Fuzzy Systems. CO4: Pattern Recognition. |

M.Sc (Maths) **Semester-III**

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| PSC MTH 11 | Complex Analysis | This course is aimed to provide an introduction to the theories for functions of a complex variable. Some of the objectives of the course is to study and understand the topics like Cauchy–Riemann Equations, Cauchy Integral Formula and its applications, Poles and residues, Mobius Transformation. | CO1: Explain the concepts of C-R Equations, Analytic Functions, and Elementary Functions. CO2: Construct the proofs of Cauchy Integral Formula, Liouville’s Theorem and solve problems related to Taylor and Laurent series. CO3: Identify different types of singularities, zeros of analytic function, Evaluation of improper integrals and apply the Rouche’s theorem to solve the problems. CO4: Understand Linear Transformation and mappings of regions under some special transformations. |
| PSC MTH 12 | Functional Analysis | The motto of course is to show interconnection between linear algebra and analysis, to examine the structure of infinite dimensional vector spaces, Hilbert spaces and the spectra. | CO1: Understand Banach Spaces, The Hahn- Banach Theorem. CO2: Study the open Mapping Theorem, Hilbert Spaces. CO3: Analyse different operators and their properties CO4: Understand Finite Dimensional Spectral Theory |

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| PSC MTH 13 | Mathemat ical Method | The aim of the course is to introduce various types of transform and there properties. Some of the objectives of the course is to study and understand the topics like Modulation theorem and Method of expansion into partial function of the ratio of two polynomial. | CO1: Understand the topic of Fourier Transform, Faltung Theorem. CO2: To study the Finite Fourier Transform and Double Transforms of partial derivative of function. CO3: Study of Laplace transform and their properties. Explain inverse Laplace transform and application. CO4: Understand the topic of Hankel Transform, The Mellin Transform. |
| PSC MTH 14(a) | Fluid Dynamics -I | The motto of course is to study the different types of Fluids and law of Thermodynamics and Equation of State of Substances. | CO1: Study of Real Fluids and Ideal Fluids, the equation of continuity, Bernoulli's Equation. CO2: Explain Stokes Stream Function, The Milne-Thomson circle theorem. CO3: Investigation of Maximum Mass Flow through a Nozzle. |
| PSC MTH 14(b) | General Relativity | The students shall be familiar with the fundamental principles of the special and general theory of relativity. They shall know the meaning of basic concepts like inertial frames and how gravity is understood as a manifestation of a curved space-time. They shall also be familiar with some of the main contents of the theory: Einstein's field equations, three crucial tests for general relativity and Schwarzschild solutions. | CO1: Describe physical phenomena in different coordinate systems. Analyze the conflict between Newtonian theory of gravitation and special theory of relativity. CO2: Define energy momentum tensor of various fluids and understand gravity due to curved space-time. CO3: Obtain Einstein's field equations by different approach and prove Newtonian theory as a first approximation. CO4: Solve Einstein's field equations for static spherically symmetric Schwarzschild space time and calculating the advances of perihelion, relativistic frequency shifts for sources moving in a gravitational field, as well as the bending of light passing a spherical mass distribution. |
| PSC MTH 14(c) | Graph Theory | The objectives of the course are to discuss the concepts of graph, tree and cut set. Discuss the Chinese Postman Problem and Travelling salesman problem. Use an algorithm to produce a plane drawing of a planar graph, know whether some special graphs are planar. | CO1: solve problems involving vertex and edge connectivity CO2: Use algorithms for finding an Euler trail in a graph for solving the Chinese Postman Problem. CO3: Model and solve real world problems using graphs and trees, both quantitatively and qualitatively. CO4: Apply Ford and Fulkerson Algorithm to real life problems |

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| PSC MTH 14(d) | Commutative Algebra | Commutative Algebra is the study of commutative rings, and their modules and ideals. This course will give the student a solid grounding in commutative algebra which is used in both algebraic geometry and number theory. | On completion of the course the student should have the following learning outcomes defined in terms of knowledge, skills and general competence: CO1: Understand the proof of snake lemma and construction of tensor product CO2: Explain localization of rings and master the concepts like extended and contracted ideals in ring of fractions CO3: Construct the proof of the primary decomposition of ideals, going up and going down theorems. CO4: Identify the relation between Artin and Noetherian rings; relate with Dedekind domains. |
| PSC MTH 14(e) | Lattice Theory | The aim of the course is how to describe Lattices, Polynomials, Identities and Inequalities. | CO1: To study the definition of Lattices, some Algebraic Concepts. CO2: To study the types of Lattice. |
| PSC MTH 15(a) | Operations Research-I | To develop the optimization techniques that will be useful in the personal and professional life. To learn the mathematical formulation of complex decision-making problems and arrives at optimal or near-optimal solutions using different techniques of operations research. | CO1: Understand basics and formulation of linear programming problems and appreciate their limitations; solve linear programming problems using graphical method. CO2: Apply simplex method to solve real life problems. CO3: Solve artificial variable technique, duality theory, revised simplex method, sensitivity analysis, transportation and assignment problems. CO4: Understand the concept of Game theory. |
| PSC MTH 15(b) | Business Mathematics | The motto of the course is to understand the Application of Matrices, Limit and Continuity, Application of Derivatives in Economics. | CO1: Explain Input-Output Analysis, Closed and Open Input-Output Models. CO2: Study Limit of a Functions, Derivative of a Functions, Concavity and Convexity. CO3: Application of Derivatives in Economics. |
| PSC MTH 15(c) | MATLAB Programming | In this course the MATLAB command, Programming in MATLAB, Linear algebra and interpolation. | CO1: Explain how to use MATLAB Programming by creating and printing simple plots, script files, functions files. CO2: Working with Array and Matrices. CO3: Controlling command windows, command line editing. |
| PSC MTH 15(d) | Statistics | The aim of the course is to introduce graphical presentation of data, Introduction of measure Central Tendency. | CO1: Data classification, Tabulation and Presentation. CO2: Measure of Central Tendency. CO3: Measure of Dispersion. |

M.Sc. (Maths)
Semester-IV

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| PSC MTH 16 | Dynamical Systems | In this course we study the Existence and Uniqueness Theorem, Continuity of solution in initial conditions, Liapunov function, monotone sequence in planar dynamical system. | On successful completion of this course, the student will be able to: CO1: Study the fundamental theorem, Existence and Uniqueness Theorem. CO2: Explain the Poincare Bendixson theorem. CO3: Understand the topic of Discrete Dynamical system, Stability and closed orbits. |
| PSC MTH 17 | Partial Differential Equations | This course aims to introduce classification of partial differential equations and to learn various methods to solve them. | CO1: Find solutions of partial differential equations and determine the existence, uniqueness of solution of partial differential equations. CO2: Classify partial differential equations. (Charpit's Method, Jacobi Method) CO3: Find Fourier sine series, Fourier cosine series, Fourier series expansion of various functions like even, odd, periodic, piecewise continuous functions. CO4: Understand convergence of Fourier series. |
| PSC MTH 18 | Integral Equations | The aim of this course is to provide adequate knowledge of fundamentals of Fredholm, Volterra and singular integral equations and develop techniques for finding its solutions. To motivate students, how to solve problems on differential and integral equations using Laplace and Fourier transforms. | CO1: Know the relation between differential and integral equations, and how to change from one to another. CO2: Understand different kinds of kernels and use techniques for solving problems on each kind. CO3: Explain Neumann series and solve linear Volterra and singular integral equations using appropriate methods. CO4: Use Laplace transform, Fourier transform for solving a wide range of differential and integral equations. |
| PSC MTH 19(a) | Fluid Dynamics- II | The aim of the course is to provide method for studying the evolution of stars, ocean currents, weather patterns, plate tectonics and even blood circulation. | CO1: Study of Navier-Stokes equation of motion of a viscous fluid. CO2: Understand the topic of Maxwell Electromagnetic field. CO3: Study of turbulence and introductory concepts. CO4: Introduction to triple velocity correlations. |

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| PSC MTH 19(b) | Cosmology | The aim of the course is the scientific study of the large scale properties of the universe as a whole. The scientific methods to understand the origin, evolution and ultimate fate of the entire universe. | On successful completion of this course, the student will be able to: CO1: Study the three types of static universe. CO2: Study of Deceleration parameter and Hubble's constant. CO3: Study the measure of Distance. |
| PSC MTH 20(a) | Operations Research-II | To learn advanced methods in operations research course that are used in the systems approach to Engineering and Management, so as to provide them with the requisite tools for the mathematical representation of decision-making problems, in particular emphasizing the roles of uncertainty and risk. | CO1: Solve real life problem using integer programming. CO2: Use dynamic programming in multistage solution problem. CO3: Deal with inventories of various goods with and without shortages. CO4: Understand and deal with queuing theory, Non-linear (concave) real life optimization problems, Quadratic programming problems. |
| PSCMT H20(B) | Elementary Discrete Mathematics | The mission of the course is to study objects that are of discrete nature. Understand the application in real life communication models, computer sciences, electronic circuits. | On successful completion of this course, the student will be able to: CO1: Understand Formal Logic, Propositional Logic, Semi groups and Monoids, Congruence relation CO2: Study Complemented and Distributive Lattices. CO3: Analyse Boolean Algebras CO4: Apply Boolean algebra to switching theory |

Sardar Patel Mahavidyalaya, Chandrapur
Program Specific Outcomes (PSOs) and Course Outcomes (COs)
Subject: Environmental Science
Name of Course: M.Sc (Environmental Science)

| PSOs | Program Specific Outcomes |
|-------------|--|
| PSO1 | Learning and understanding basic concepts of Environmental Science and Skills/techniques of environmental analysis (air, water and soil) |
| PSO2 | Understanding towards environmental issues, concepts like Ozone layer depletion, Green House Gases, impact of global warming and Climate change and related mitigation strategies. |
| PSO3 | Apply their knowledge for efficient environmental decision-making environmental management and sustainable development concept. |
| PSO4 | Students have the opportunity of Job and Services in the field of teaching, research projects, water and sanitary departments, Industries, Pollution control board, NEERI, EIA, forestry, etc. |

| | Course Outcomes (COs), M.Sc., Semester I Paper 1: Environmental Chemistry |
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| COs1 | Introduction and concept of chemistry in environment, classification of elements, Lambert and Beer's Law, Nernst distribution law, Gibb's energy, stoichiometry. |
| COs2 | Basic concept of Environmental chemistry, solubility, equilibrium, unsaturated and saturated hydrocarbon, radionuclides, measuring redox potential, Green chemistry for sustainable future |
| COs3 | Sources, uses and physico-chemical characteristics of water, Eh-pH diagram, Ionic product of water, metal in aqueous solution. |
| COs4 | Introduction to soil chemistry, physicochemical properties of soil, types of soil in India and Maharashtra, macro and micro nutrients in soil, NPK. |
| | Paper 2: Fundamentals of Atmospheric Science |
| COs1 | Basic concept of atmospheric science, first and second law of thermodynamics, reaction in atmosphere. |
| COs2 | Basic of climatology, depletion of solar radiation, meteorological process and applied climatology. |
| COs3 | Basic of meteorology, primary and secondary meteorological parameters and their measurements, effects of meteorological parameters on environment, applied meteorology. |
| COs4 | Concept of Green House Effect and global warming. |
| COs5 | Ozone Chemistry, Antarctic ozone hole and consequences, advanced research to |

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| | protect ozone layer |
| COs6 | Implications of climate change, EL Nino and La Nino phenomenon. |
| | Paper 3: Ecology |
| COs1 | Fundamentals of ecology, introduction of ecology, Liebig's law of minimum, Shelford's law of tolerance, Biotic potential and carrying capacity. |
| COs2 | Fresh water ecology, planktons and its types, biotic interactions. |
| COs3 | Population ecology, community ecology, ecological succession. |
| COs4 | Concepts, structure, function and types of ecosystem, biogeochemical cycles and productivity, concept of eco-stability. |
| | Paper 4: Environmental Pollution |
| COs1 | Basic of air pollution, Vehicular pollution, photochemical smog, Urban heat island phenomenon. |
| COs2 | Basics of water pollution, thermal pollution, oil pollution, eutrophication. |
| COs3 | Soil pollution, soil deterioration, bioremediation and phytoremediation. Soil erosion |
| COs4 | Introduction to noise pollution, ambient air standards with respect to noise, solid waste sources, classification and disposal methods, radiation pollution , effects episodes and control measures. |
| | M.Sc., Semester II |
| | Paper 5: Environmental Sampling and analysis |
| COs1 | Air pollution sampling, site selection criteria, stack sampling. |
| COs2 | Particulate sampling methods, Dust fall jar, high volume sampler. |
| COs3 | Analysis of SO ₂ , Nox and hydrocarbons. |
| COs4 | Sampling sites selection for river, groundwater and lake. |
| COs5 | Sampling equipment, sampling containers and preservation of water sample. |
| COs6 | Water analysis for different physical, inorganic, organic, trace metals and biological parameters. |
| COs7 | Types of soil survey, its method collection of soil samples and procedure for soil sampling and its preservation. |
| COs8 | Soil analysis for different parameters. |
| COs9 | Sampling of noise site identification very close and noise measurement techniques. |
| COs10 | Effect of meteorological parameters on noise propagation, occupational health. |
| | Paper 6: Natural resources conservation and management |
| COs1 | Classification of natural resources types of natural resources mineral resources its importance formation mining and its consequences conservation of energy resources. |
| COs2 | Non conventional energy sources like solar energy its conversion advantage and disadvantages application of solar energy. |
| COs3 | Hydro energy turbines and generator for small scale hydroelectric generation tidal energy its principle advantages and disadvantage. |
| COs4 | Basic principle of tidal energy Ocean thermal electric conversion |
| COs5 | Basic principle of wind energy geothermal energy and biomass. |

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| | Paper 7: Environmental disaster and environmental biotechnology |
| COs1 | Introduction of geological hazards and its types preventive measures. |
| COs2 | Introduction, scope ,importance of environmental microbiology, structure of microorganisms, classification of microorganisms, role of microorganisms in air water and soil for microbial qualities |
| COs3 | Microbial types of culture, sterilization and disinfection, applied microbiology. |
| COs4 | Introduction, scope of environmental biotechnology, applied biotechnology, microbes and energy, Production of ethanol methane and hydrogen. |
| COs5 | Research methodology, data collection and sampling interpretation and report writing |
| | Paper 8: Analytical techniques for environmental monitoring |
| COs1 | Definition theory and classification of chromatographic separations. |
| COs2 | Introduction to gas chromatography |
| COs3 | Liquid chromatography |
| COs4 | Principle working and application of absorption spectroscopy |
| COs5 | UV visible spectroscopy infrared spectroscopy and nuclear magnetic resonance |
| COs5 | Atomic absorption spectroscopy flame photometer turbidity metre |
| COs6 | Introduction types principle instrumentation and application of polarography in environmental chemical analysis |
| COs7 | Aniodic stripping voltametry with its application in environmental measurement |
| COs8 | Basic principle classification of electrodes measurement method instrumentation and application in the analysis of fluoride nitrate cyanide ammonia sulphide. |
| COs9 | Modern instrumental techniques |
| COs10 | Types of error minimization of error |
| COs11 | Mean mode median and range standard deviation relative deviation and arithmetic problems |
| | M.Sc., Semester III |
| | Paper 9: Water Treatment and supply |
| COs1 | Quality and Quantity of water, Wholesome water, factors affecting estimated population, sources of water supply. |
| COs2 | Physical treatment, schematic layout of water treatment plant, Preliminary treatment of water, and sedimentation |
| COs3 | Water distribution system, maintenance of distribution system. |
| COs4 | Chemical treatment of water coagulation,, filtration, and disinfectant |
| | Paper 10: Wastewater Treatment |
| COs1 | Sources of wastewater Domestic sand industrial wastes, Quality and quantity of sewage, analysis of sewage. |
| COs2 | Wastewater Engineering, Design of preliminary and primary units, Design of biological unit |

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| COs3 | Primary treatment, primary treatment process Coagulation |
| COs4 | Secondary and tertiary treatment filters, trickling filters, Biological treatment process, Tertiary wastewater treatment. Wastewater treatment for pulp and paper, iron & steel and cement industry. |
| | Paper 11: Solid and Hazardous waste Management |
| COs1 | Characteristics of solid waste, physical, chemical and biological classification of solid waste, Collection system, separation and processing. |
| COs2 | Municipal solid waste management, Land filling, GIS based site Solid waste management, Integrated waste management. |
| COs3 | Hazardous waste, identification of hazardous waste, Toxicity of hazardous waste, Public health hazards. Food adulterants and radioactive substances. |
| COs4 | Hazardous waste management. Waste treatment, solidification and stabilization, Thermal destruction, secured landfill, Waste minimization, elements of waste minimization program, waste reduction techniques. |
| | Paper 12: Fundamentals of Environmental Science |
| COs1 | Basics of environmental science, Atoms, and molecules, Earth, Evolution of India, Environmental chemistry,, Geosciences, Theoretical & applied aspects of environmental, |
| COs2 | Earth surface processes, Atmosphere, Earth system process, continental collision and mountain formation with specific example of Himalaya, Land surface process, and glaciated landscapes: coastal process. |
| COs3 | Environmental problems, global warming, Global climate change, Ozone layer protection. |
| COs4 | Sustainability and sustainable development, Ethics and landmark judgment Agenda 21. |
| | M.Sc., Semester IV Paper 13: EIA and Environmental Laws |
| COs1 | EIA planning tool, Scope of EIA, identification of Impact, prediction, Impact evaluation & analysis. EIA for Industry. |
| COs2 | EIA methods, EIA case studies, Environmental audit- pre, onsite and post audit. |
| COs3 | Constitution and environment. Constitutional law, Constitution and environment |
| COs4 | Judicial activism and environmental protection. |
| COs5 | Environmental Laws, Environmental protection, basics environmental laws, specific environmental laws. |
| | Paper 14: Pollution Control and Industrial Safety |
| COs1 | Industrialization, basics for industrialization, industrial economics, Industrial policy. |
| COs2 | General treatment, pollution control for specific pollutants, removal of ammonia/urea and phenolic effluents. |

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| COS3 | Operation and maintenance of treatment units, Preliminary, primary, secondary , tertiary treatment units. |
| COs4 | Industrial safety and security, industrial accidents, industrial hazards, industrial safety and security. |
| | Paper 15: Environmental and Energy Management |
| COs1 | Industry and Environment, Industry and environment, Industrial pollution control, greening of industry. |
| COs2 | Corporate environmental Management system, EMS structure, EMS and industries. |
| COs3 | Energy and Environment, Energy pattern, socioeconomic implications of energy use pattern. |
| COs4 | Energy technology and management, Renewable and advanced technology. |
| | Paper 16: Sustainable Environment |
| COs1 | Emission trading, joint implementation (JI) clean development mechanism (CDM) reduction emissions from deforestation and degradation (REDD). |
| COs2 | Environmental accounting, Valuation of natural asset, 3. |
| COs3 | Environmental philosophy, environmental ethics, Eccentric theories of nature. Environmental attitudes. |
| COs4 | Basics of Sustainable development, environmental sustainability, Society and environment, Intellectual property rights, patenting procedure in India and abroad. |

Dr. Kavita S. Raipurkar

HOD

Department of Environmental Science

Sardar Patel Mahavidyalaya,

Chandrapur

Department Of Geography

Subject Out Come

- **Cartographer.**
- **Commercial/residential surveyor.**
- **Environmental consultant.**
- **Geographical information systems officer.**
- **Planning and development surveyor.**
- **Secondary school teacher. Social researcher.**
- **Town planner.**
- **Teacher / lecturer**
- **Agriculturist**

Practical Out Come

PSO1.Acquireing Knowledge of Physical Geography:

Student will gain the knowledge of physical geography. Student will have a general understanding about the geomorphological and geotechnical process and formation. They will be able to correlate the knowledge of physical geography with the human geography.

PSO2.Acquireing Knowledge of Human Geography:

They will be able to acquire the knowledge of Human Geography and will correlate it with their practical life.

PSO3.Conduct Social Survey Project:

They will be eligible for conducting social survey project which is needed for measuring the status of development of a particular group or section of the society.

PSO4. Application of GIS and modern Geographical Map Making Techniques:

They will learn how to prepare map based on GIS by using the modern geographical mapmaking techniques. Subject like GIS & Remote sensing can be a tool of future employment

PSO5. Understand Environmental Ethics and Sustainability:

Understand the impact of the acquired knowledge in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

A) Theory Out Come

COC 1- Know The variety of landforms on the surface .

COC-2 Understand the Information about planets and solar system origin.

Drown Map from map scale.

COC-3 Acquire the Knowledge of different climate region and climate change.

COC-4 Understand the future weather condition through the daily Indian weather map.

CCO-5 Create Isopleths map from nature element and figures.

COC-6 Understand the role of Earth's internal and external forces causes surface change and landforms to occur

COC-7 Landform formation can be compared to the previous causes and types

COC-8 Its formation and type of rock can be deduced from the type of rock

COC-9 The ocean floor structure can be deduced from the study of oceanography

COC-10 The effect of nature elements in the ocean on humans can be studied

COC-11 Student can survey a place using various survey method

Student can do a comparative study of the population of Maharashtra,

COC-12 India & the World through population geography

COC-13 Subject like GIS & Remote sensing can be a tool of future employment

COURSE OUTCOMES OF THE COURSE (GEOGRAPHY)

GEOMORPHOLOGY

CO1: Understand earth's tectonic and structural evolution.

CO2: Gain knowledge about earth's interior.

CO3: Develop an idea about concept of plate tectonics, and resultant landforms.

CO4: Acquire knowledge about types of folds and faults and earthquakes, volcanoes and associated landforms.

CO5: Develop an idea about geomorphology and different types of fundamental concepts.

CO6. Explain different types of geomorphic processes like weathering and mass wasting and cycle of erosion.

CO7: Understand the processes of erosion, deposition and resulting landforms.

CO8: Acquire knowledge about slope forms and processes.

CO9: Identification of different types of rock and minerals.

CLIMATOLOGY

CO1. Learn the interaction between the atmosphere and the earth's surface.

CO2. They will be able to understand the importance of the ozone layer and bad effect of green- house gasses moreover will be eligible to apply this for the solution of environmental problem.

CO3. They understand how the planetary and periodic wind and pressure belt related to each other. Also they understand how to develop the tropical cyclones, El Nino and La Nina.

CO4. Students can explain the important role of water to create condensation and precipitation.

PRACTICAL GEOGRAPHY

CO1. Develop an idea about scale and draw different types of scale like linear, diagonal Time & Distance,

CO1. Learn to use of various meteorological instruments.

CO2. Gain knowledge about Indian daily weather report.

CO3. Learn to use tabulation of data.

CO4. Learn to draw monthly temperature and rainfall graphs.

PRACTICAL GEOGRAPHY

CO1. Know about diagrammatic data presentation like line, bar and circle.

CO2. Develop an idea about different types of thematic mapping technique

CO3. Brings direct interaction of different types of surveying instruments like Dumpy level and Theodolite with environment.

CO4. They can know about remote sensing & GIS

CO5. Gain knowledge about association and correlation

CO6. Gain knowledge about measuring arithmetic growth rate of population and also measures of inequality.

GEOGRAPHY OF INDIA & MAHARASHTRA

CO1. They can know about their own countries land formation, climate and natural vegetation.

CO2. They understand the economic resources of India.

CO3. They understand the social distribution of population of their country.

ECONOMIC GEOGRAPHY

CO1. Understand the concept of economic activity, factors affecting location of economic activity.

CO2. Gain knowledge about different types of primary activities.

CO3. Develop an idea about different types of secondary activities.

CO4. Acquire knowledge about different types of tertiary activities

SETTLEMENT GEOGRAPHY

CO1. Build an idea about urban and rural settlements, and its relationship

CO2. Know about classification and morphology of settlements.

CO3. Understand the trends and patterns of world urbanization.

CO4. Know about different theories of urban growth.

GEOGRAPHY OF RESOURCES

CO1. Develop an idea about resource.

CO2. Understand the concept of different types of resources.

CO3. Acquire knowledge about different types of power resources.

CO4. Explain population - resource relationship and different types of population resources.

सरदार पटेल महाविद्यालय, चंद्रपुर

PSOs of Hindi

१. राजभाषा हिन्दी के कार्यालयीन स्वरूप को छात्रों तक पहुंचाना जिससे व प्रशासकीय कार्य हिन्दी में सटिकता से करते हैं।
२. राजभाषा हिन्दी के प्रचार—प्रसार करने के लिए हिन्दी भाषा तथा साहित्य का अध्ययन—अध्यापन छात्रों में नयी दृष्टि उत्पन्न करता है।
३. हिन्दी भाषा व साहित्य का अध्ययन करने के बाद छात्र अनुवाद, प्रूफ रिडींग के क्षेत्र में कार्यरत होते हैं।
४. विज्ञापन लेखन, समाचार लेखन (टि.व्ही, रेडिओ, समाचारपत्र) पटकथा लेखन, संवाद लेखन में भी कार्यरत होते हैं।
५. भाषा शैली के विकास के कारण वे व्यक्तिमत्त्व विकास, उद्बोधन, सलाहकार, वक्ता आदि के कार्य में भी रोजगार प्राप्त करते हैं।
६. हिन्दी भाषा व साहित्य का अध्ययन कर हिन्दी के छात्र बड़े—बड़े कार्यक्रमों का सूत्रसंचालन में भी रोजगार प्राप्त करते हैं।
७. हिन्दी भाषा के अध्ययन के बाद रेल विभाग, सुरक्षा मंत्रालय, बैंक आदि अनेकों सरकारी संस्था में राजभाषा अधिकारी के रूप में कार्यरत हैं।
८. संगणक (Computer) के क्षेत्र में हिन्दी भाषा में बहुत संघीयों उपलब्ध है। छात्र इसका लाभ उठाते हैं। व आर्थिक उपार्जन करते हैं।
९. साहित्य लेखन (काव्य, कहानी, नाटक, एकांकी, रेखाचित्र) का लेखन भी कर सकते हैं।
१०. भाषा के माध्यम से विज्ञापन लेखन में भी रोजगार मिलता है।
११. भाषा व साहित्य छात्रों को निर्जीव मानव न बना सजीव मानव बना मानवता के गुणों से परिपूर्ण करता है।
१२. हिन्दी भाषा के अध्ययन अध्यापन से छात्रों की सुशिक्षित, सुसंस्कृत, सुशासन, सुव्यवस्था, की पहचान करा भविष्य के सुनागरिकों का निर्माण भी करता है।
१३. युवा पिढ़ी को हिन्दी भाषा व साहित्य चिन्ता, निराशा व आत्महत्या में परावृत्त करने का सबसे बड़ा कार्य उनके जीवन में करता है।