Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

Two Year Master of Science in Environmental Science Programme

M.Sc. EVS Semester-II

(Effective from the session: 2022-2023)

Shri Rawatpura Sarkar University
Raipur, Chhattisgarh
Faculty of Science
Department of Chemistry
Two Year Master of Science in Environmental Science Programme
M.Sc. EVS Semester-II
Scheme of Teaching and Examination

Outcome Based Education (OBC) and Choice Based Credit System (CBCS)
(Effective from the session: 2022-2023)

S. No.	Course Code	Course Title	Hours/ Week			Credit	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuation Evaluation	Semester End Examination	Total	
1	SMS05201T	Environmental Pollution and Control I: Water and Soil	4	-	-	4	30	70	100	3.0
2	SMS05202T	Environmenal Geosciences	4	-	-	4	30	70	100	3.0
3	SMS05203T	Biodiversity, Forestry and Natural Resources	4	-	-	4	30	70	100	3.0
4	SMS05204T	Analytical Methods in Environmental Sciences	4	-	-	4	30	70	100	3.0
5	SMS05281T	EVS Lab course: III	-	-	4	2	-	-	50	5.0
6	SMS05282T	EVS Lab Course: IV	-	-	4	2	-	-	50	5.0
7	SMS05221T	Research Methodology	2	-	-	2	15	35	50	2.0
	Total teaching hrs/week: 26		**Total Credits**			**22**	**Total Marks**		550	

Two year Master of Science in Environmental Science programme
M.Sc. Environmental Science Semester-II
2022-2023

Course Title	**ENVIRONMENTAL POLLUTION AND CONTROL I: WATER AND SOIL**				
Course Code	**SMS05201T**				
Course Credit	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisite	**Basic knowledge of Environmental pollution**				
Objective	• **Environmental pollution in advance and establish foundation to research in the respective domain.**				
Course Content	**UNIT 1** **Freshwater Pollution:** Types and sources, sampling methods. Water Quality parameters, Types and sources of water pollution, various pollutants responsible for water pollution: Biological pollutants; Inorganic; Organic; Heavy metals; Pesticides; Radioactive pollutants, etc. Various sources effluent standards, Drinking water standards, Characteristics of Domestic waste, Characteristics of Agricultural waste, Consequences of water pollution: Effects on health, on biosphere and on economy, Sampling methods: Purpose of sampling, different types of samples, collection methods and various instruments used for it. Methods involved in estimation of parameter for pollution levels **UNIT II** **Ground water pollution:** Piezometer test – Pumping tests – Estimation of saturated hydraulic conductivity – Numerical simulation for aquifer yield prediction – Artificial recharge and induced infiltration – Land subsidence – Sea water intrusion. **UNIT III** **Marine water pollution**: Types, sources and consequences. Specifications for disposal of sewage and industrial waste into sea. Disposal of sewage and wash water from MV cargo and ships. Pollution due to off shore drilling, deep mining and oil extraction. **UNIT IV** Eutrophication: Definition, Limnology of lake, process of eutrophication. Control measures of water pollution: Stabilization of ecosystem, Reutilization and Recycling of waste water, Removal of Pollutants through laws and regulations. **UNIT V** **Soil pollution**: Types, sources and consequences. Sampling methods. Contaminant fate and transport in soil. Transport processes — biological				

	process-microbial transformation of heavy metals. Specifications for disposal of sewage and effluent on land for irrigation and ground water recharge. Methodology of wastewater disposal on land in India. Impacts of usage of land for solid waste disposal both municipal solid waste and industrial solid wastes (fly ash from thermal power station, lime sludge from pulp and paper mills). Disposal of hazardous solid waste (heavy metals, toxic organic compounds) on land and its impact on soil pollution. Deterioration of soil due to mining activities Control measures of soil pollution: Case study of restoration of land due to a. disposal of fly ash, b. dumping overburden and tailing in iron ore extraction.
Course Outcome	On the completion of this course successfully student will be able to CO 1 : Understand the Water Quality parameters, Types and sources of water pollution CO 2 : Gain knowledge about the Ground water pollution its effects. CO 3 : Learn about the Marine water pollution and its sources. CO 4 : Study on Eutrophication and its process. CO 5 : Understand the sources of Soil pollution and its control
Text Books	1. Environmental Chemistry, B. K. Sharma 2. Environmental Chemistry and Pollution Control, S. S. Dara 3. Environmental Pollution, N. Manivasakam • Environmental Chemistry, Samir K. Banerji 4. Calvin Rose, An Introduction to the Environmental Physics of Soil, Water and Water Sheds, Cambridge University Press, 2004.
Reference Books	1. Paul Nathanail C. and Paul Bardos R., Reclamation of Contaminated Land, JohnWiley & Sons Limited, 2004. 2. Hari D. Sharma and Krishna R. Reddy, Geo-Environmental Engineering : Site Remediation, Water Contaminant and Emerging Water Management Technologies, John Wiley & Sons Limited, 2004. 3. William J. Deutsch, Groundwater Geochemistry : Fundamentals and Applications to Contamination, Lewis Publishers, 1997.

Two year Master of Science in Environmental Science programme
M.Sc. Environmental Science Semester-II
2022-2023

Course Title	**ENVIRONMENTAL GEOSCIENCES**				
Course Code	**SMS05202T**				
Course Credit	**L**	**T**	**P**	**TC**	
	4			**4**	
Prerequisite	**Basic knowledge of Geosciences**				
Objective	• **Environmental Geosciences in advance and establish foundation to research in the respective domain.**				
Course Content	**UNIT I** **Fundamentals of Geosciences** : Different spheres in the earth: lithosphere, hydrosphere, atmosphere, biosphere; Primary differentiation and formation of core, mantle, crust, magma generation and formation of igneous rocks: earth dynamic processes: plate tectonics, types of plates ,isostacy, geomorphic agents: river, wind, snow, glacier, volcanoes, weathering, erosion, transportation and deposition of earth's materials by running water, wind and glaciers: formation of land forms and sedimentary rocks **UN** **IT II** **Environmental Geochemistry** : Concept of major, trace and rare earth element, Geochemical classification of elements: Abundance of elements in the bulk earth, crust, hydrosphere, atmosphere and biosphere. mobility of trace elements, geochemical cycles, biogeochemical factors in environmental health, human use, trace elements and health, Mineral stability diagrams and controls on the chemistry' of natural waters. **UNIT III** **Surface Water Resources and Environment** : Global water balance, ice sheets and fluctuation of sea levels, origin and composition of sea water, hydrological cycle, and its components. Precipitation(Various form of precipitation, interpretation of precipitation data), Evaporation and Evapo-transpiration (Meteorological factors, transpiration, methods of estimating evaporation from land surface using Penman's equation), Infiltration and percolation(Infiltration capacity of soil, Factors influencing infiltration capacity, methods of determining infiltration capacity) Runoff(Duration of runoff, flow rating curves-their determination, adjustment and extension, catchment characteristics and their effects of runoff), climatic factors. Hydrological forecasting: Frequency analysis, probability of the N-year event, series of events, Probability plotting, cyclical nature of hydrological phenomena. **UNIT IV** **Ground Water Resources and Environment :** The occurrence of ground water factors of influence, ground water flow, abstraction of ground water,				

	Darcy's law: Darcy's experiment; Fundamental Equation of ground water flow: Generalization of Darcy's law. Aquifer and its types; Confined and Unconfined aquifers; Properties of Aquifer, permeability, porosity. Groundwater occurrence & movement; Ground water levels and Environmental influences. **UNIT V** **Natural hazards and disaster:** Concepts; Landslides and slope failures, earthquakes, river and coastal erosion, Tsunami, Desertification, water logging, salinization and soil degradation. Atmospheric disturbances: Thunderstorms, cyclones, lightening, flood, and drought. Impact of anthropogenic activities such as urbanisation, mining, river-valley projects, excess withdrawal of ground water, etc
Course Outcome	On the completion of this course successfully student will be able to CO 1 : Understand the Different spheres in the earth CO 2 : Gain knowledge about the Geochemical classification of elements CO 3 : Learn about the Surface Water Resources CO 4 : Study on Ground Water Resources CO 5 : Understand the sources of Soil pollution and its control
Text Books	1. Environmental Geology: Indian Context by K.S.Valdiya ,Tata Macgraw Hill Environmental Science : E. D. Enger and B. F. Smith 2. Introduction to Geochemistry : Krauskoph K. B. 3. Geology and our environment, Davis, S. N. , Reiton, P. H.& Pestrong, P. Mc.Graw Hill, NY 4. Environmental Geology, Keller, E,.A., Bell &Howell, Columbus, Ohio
Reference Books	1. Physical Geology, Strahler, A. N., John Harper & Row Focus on Environmental Geology, Tank, R.W.Oxford Univ. Press 2. Text Book of Geology, P. K. Mukherjee 3. Environmental geology, Coates, D. R. , John wiley, NY 4. Chamley, H. and Chamley, H. 2003. Geosciences, Environment and Man Elsevier Science & Technology. 5. Savindra Singh (2002): Geomorphology, Prayag Pustak Bhawan, Allahabad.

Two year Master of Science in Environmental Science programme
M.Sc. Environmental Science Semester-II
2022-2023

<table>
<tr><td>Course Title</td><td colspan="5">BIODIVERSITY, FORESTRY AND NATURAL RESOURCES</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS05203T</td></tr>
<tr><td rowspan="2">Course Credit</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisite</td><td colspan="5">Physical Chemistry: I</td></tr>
<tr><td>Objective</td><td colspan="5">Natural resources in advance and establish foundation to research in the respective domain.</td></tr>
<tr><td>Course Content</td><td colspan="5">UNIT I
Bio-Resources: An inventory of Global and Indian biological resources and their present and potential uses. Valuation of bio-resources and current and potential threats, Traditional cultivars of crop species and their evaluation, Traditional livestock resources and their evaluation, Current status of exploitation of wild species (terrestrial), Current status of marine resources, and trends in their usage pattern, Traditional knowledge systems (including medicine, ethno-botany, water and soil conservation and other cultural practices), their evaluation and protection under IPR regime.

International conventions and treaties for conservation of bio-resources (including WCS, CBD, CITES, IPCC, Ramsar Convention, UNCLOS, Montreal Convention and others). National Laws, policies and action plans for conservation of forests, wildlife, biodiversity, marine resources as well as for people’s participation in conservation efforts. Role of NGOs in conservation of bio-resources and people’s participation in such efforts at global, national and grassroots level.
UNIT II
Global and National biodiversity: . Magnitude and distribution of Biodiversity (global and Indian) and its characterization. Rapid assessment of biodiversity and its valuation; skills, trained personnel and resources needed for the task. Evaluating nature, scale and intensity of the threats to biodiversity. Developing measures for conservation of biodiversity and approaches to its sustainable utilization.

Environmental education at academic and non-formal levels, Role of youth in conservation education and action, Participation in conservation issues and action at national and local levels, Generating, sustaining and implementing conservation action at grassroots levels (eg resource conservation, waste disposal, conservation of wildlife in populated and protected landscapes)

UNIT III</td></tr>
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	Plant Resources: Role of plants in natural ecosystems and life support systems (terrestrial, freshwater and marine) Importance of traditional cultivars and wild species in agriculture Role of plants in modern and traditional medicine Value of plants in scientific research and technological inventions Plants in modern lifestyle and economy Approaches to conservation of plants (in situ and ex situ). **Animals Resources:** Role of animals in conservation of natural ecosystems Role of wild and domesticated gene-pool in human nutrition Importance of wild species (terrestrial and marine) in medicine Animals in modern society and economy Importance of wild species in scientific research and inventions Value of microbes in medicinal, scientific and technological research, solutions and inventions. **UNIT IV** **Ecosystem resources:** Economic value of natural ecosystems and their processes in global and national economies, Understanding the limits to exploitation and sustainability, Developing alternative resources/ technologies / usage patterns, Ecotourism in wilderness and protected area network **People resources:** Understanding the growth of human population, its pattern, causes and consequences, Economic development, technological inventions and their impact on lifestyle as well as environment, Environmental cost (direct and indirect) of human conflict, Strategy for constructive involvement of communities (urban and rural) in conservation of biological resources **UNIT V** **Forestry :** Forests and Forestry: Forest types of the world. Champion and Seth's Forest Types of India. Forest diversity of Oriental Region. Forest Management: Working plans in forestry. Forests Departments and their structure. Conservation and protection of natural forests. Nursery, seed stock and forest plantation. Community participation in forestry: Joint forest management. Social forestry. Ecodevelopment. Habitat management in wastelands for forestry and national resources conservation. Traditional knowledge and management practices: Medicinal plants in forestry. Rare and endangered forest species. Future sciences in forestry applications.
Course Outcome	On the completion of this course successfully student will be able to CO 1 : Understand the Valuation of bio-resources and current and potential threats. CO 2 : Gain knowledge about the Global and National biodiversity CO 3 : Learn about the plant and animal resources. CO 4 : Study on Ecosystem resources

	CO 5 : Understand the Conservation and protection of natural forests
Text Books	1. Chaudhuri AB and Sarkar DD (2003) Megadiversity Conservation, Flora, Fauna and Medicinal Plants of India's Hotspots. Daya Publishing House, New Delhi. 2. Gary K Meffe and Ronald Carroll C (1994) Principles of Conservation Biology. Sinauer Associates Inc., Massachusetts. 3. Groombridge B (Ed.) (1992) Global Biodiversity Status of the Earths Living Resources. Chapman & Hall, London. 4. IUCN (1992) Global Biodiversity and Strategy. Sharma PD (2000) Ecology and Environment. Rastogi Publications, Meerut, India. 5. Singh MP, Singh BS and Soma S. Dey (2004) Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
Reference Books	1. Virchow D (1998) Conservation and Genetic Resources, Springer-Verlag, Berlin. 2. Singh B, Social Forestry for Rural Development, Anmol Publishers, New Delhi (1992). 3. Murthy J.V.S., Watershed Management in India, (1994). 4. Raymond F Dasmann, Environmental Conservation, John Wiley (1984). 5. Kato, M. The Biology of Biodiversity, (1999), Springer Verlag, Tokyo. 6. Kotwal, P.C. and S. Banerjee. Biodiversity Conservation – In Managed forest and Protected areas, (2002). Agrobios, India. 7. Krishnamurthy, K.V. An Advanced Textbook on Biodiversity – Principles and Practice, (2003). Oxford and IBH Publishing, New Delhi.

Two year Master of Science in Environmental Science programme
M.Sc. Environmental Science Semester-II
2022-2023

<table>
<tr><td>Course Title</td><td colspan="5">ANALYTICAL METHODS IN ENVIRONMENTAL SCIENCES</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS05204T</td></tr>
<tr><td rowspan="2">Course Credit</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisite</td><td colspan="5">Theory and Application of Spectroscopy I</td></tr>
<tr><td>Objective</td><td colspan="5">• ANALYTICAL METHODS</td></tr>
<tr><td>Course Content</td><td colspan="5">UNIT I
Ultraviolet and visible spectroscopy:-Introduction, intensity of vibrational-electronic spectra and Frank-Condon principle for dissociation energy, rotational fine structure of electronic-vibrational spectra, Shape of some molecular orbitals viz., H_2, He_2, N_2, O_2. Electronic spectra of organic molecules, chromophores, application of electronic spectroscopy: spectrophotometric studies of complex ions, determination of ligand/metal ratio in a complex, identification of compounds, determination stability constants.
UNIT II
Infra red spectroscopy:-Introduction, simple and anharmonic oscillators in vibrational spectroscopy, diatomic-vibrating rotator, Modes of vibration in polyatomic molecules, vibration-coupling, Fourier Transform IR spectroscopy: instrumentation, interferometric spectrophotometer, sample handling, Factors influencing vibrational frequencies, Application of IR spectroscopy: Interpretation of IR spectraof normal alkanes, aromatic hydrocarbons, alcohols and phenols aldehydes and ketones, ethers, esters, carboxylic acids and amines and amides
UNIT III
Mass spectrometry:-Introduction, basic principles, separation of the ions in the analyzer, resolution, molecular ion peak, mass spectral fragmentation of organic compounds, factors affecting fragmentation, McLafferty rearrangement. Instrumentation, Characteristics of mass spectra of Alkanes, Alkenes, Aromatic hydrocarbons, Alcohols, Amines. Nitrogen rule, ring rule, Molecular weight and formula determination, Gas chromatography-Mass spectrophotometry: Introduction.
UNIT IV
Nuclear resonance spectrophotometry:-Theory of NMR spectroscopy, interaction of nuclear spin and magnetic moment, chemical shift, processional motion of nuclear particles in magnetic field, spin-spin splitting, coupling constants, factor affecting the chemical shift, shielding effect, effect of chemical exchange, hydrogen bonding, instrumentation of</td></tr>
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	Fourier transform NMR spectrophotometer, structure determination of organic compounds, Carbon-13 NMR spectroscopy, Multiplicity-proton (1H) decoupling-noise decoupling, offresonance decoupling, selective proton decoupling, chemical shift. **UNIT V** **Electron Spin Resonance Spectroscopy:** Hyperfine coupling, spin polarization for atoms and transition metal ions, spin-orbit coupling and significance of g-tensors, application to transition metal complexes (having one unpaired electron) including biological systems and to inorganic free radicals such as PH4, F2 and [BH3]. **Mossbauer Spectroscopy:** Basic principles, spectral parameters and spectrum display. Application of the technique to the studies of (1) bonding and structures of Fe^{+2} and Fe^{+3} compounds including those of intermediate spin, (2) Sn^{+2} and sn^{+4} compounds - nature of M-L bond, -coordination number, structure and (3) detection of oxidation state and in equivalent MB atoms
Course Outcome	On the completion of this course successfully student will be able to CO 1 : Understand the principles of Ultraviolet and visible spectroscopy and its application CO 2 : Understand the principle of Infra red spectroscopy and its instrumentation CO 3 : The instrumentation method Mass spectrometry and its application. CO 4 : Understand Nuclear resonance spectrophotometry and its application. CO 5 : Gain the knowledge of Electron Spin Resonance Spectroscopy and Mossbauer Spectroscopy
Text Books	1. Modern Spectroscopy, J.M. Hollas, John Viley. 2. Applied Electron Spectroscopy for chemical analysis d. H. Windawi and F.L. Ho, Wiley Interscience. 3. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Harwood. 4. Physical Methods in Chemistry, R.S. Drago, Saunders College.
Reference Books	1. Introduction to Molecular Spectroscopy, G.M. Barrow, McGraw Hill. 2. Basic Principles of Spectroscopy, R. Chang, McGraw Hill. 3. Theory and Application of UV Spectroscopy, H.H. Jaffe and M. Orchin, IBHOxford. 4. Introduction to Photoelectron Spectroscopy, P.K. Ghosh, John Wiley. 5. Introduction to Magnetic Resonance. A Carrington and A.D. Maclachalan, harper & Row.

Two year Master of Science in Environmental Science programme
M.Sc. Environmental Science Semester-II
2022-2023

Course Title	**EVS LAB COURSE: III**				
Course Code	**SMS05281P**				
Course Credit	**L**	**T**	**P**	**TC**	
	-	**-**	**2**	**2**	
Prerequisite	**EVS Lab Course: I**				
Objective	• **To understand the practical concepts of Environmental Science**				
Course Content	1. Determination of NPK in water, soil and sediment. 2. Determination of Al in water, soil and sediment. 3. Determination of Mg and Ca in water, soil and sediment. 4. Detection and determination of micronutrients in water, soil and sediment. 5. Determination of Cl in water, soil and sediment. 6. Determination of SO_4^{2-} in water, soil and sediment. 7. Determination of NO3- in water, soil and sediment. 8. Determination of NH4+in water, soil and sediment. 9. Other advanced practical.				
Course Outcome	On the completion of this course successfully student will be able to CO 1 : Determine the NPK in water, soil and sediment. CO 2 : Complexometric determinations of 1.Mg and Ca in water, soil and sediment. CO 3 : Determine of Cl in water, soil and sediment. CO 4 : Determine the SO_4^{2-} in water, soil and sediment. CO 5 : Determine the NO3- in water, soil and sediment.				
Text Books	1. Vogel's Textbook of Quantitative Analysis, revi Mendham, ELBS. 2. Synthesis and Characterization of Inorganic Compounds, W.L. Jolly, Prentice Hall. 3. Practical Organic chemistry by A. I. Vogel. 4. Practical Organic chemistry by Mann and Saunders. 5. Practical Organic chemistry by Garg and Salija.				

Reference Books	1. The Systematic Identification of Organic compounds, R. L. Shriner and D. Y. Curtin. 2. Semimicro Qualitative Organic Analysis, N.D. Cheronis, J. B. Entrikin and E. M. Hodnett. 3. Practical Physical chemistry by Alexander Findlay. 4. Experimental Physical chemistry, D. P. Shoemaker, G. W. Garland and J. W. Niber, McGraw Hill Interscience. Findlay's Practical Physical chemistry, revised B

Course Title	**EVS LAB COURSE: IV**				
Course Code	**SMS05282P**				
Course Credit	**L**	**T**	**P**	**TC**	
	-	**-**	**2**	**2**	
Prerequisite	**EVS Lab Course: II**				
Objective	• **To understand the practical concepts of spectroscopy and physical chemistry**				
Course Content	1. Flame photometric determinations a. Sodium and potassium when present together. b. Sodium/potassium in solid samples. c. Solid Sodium and Potassium in Liquid Samples. d. Lithium/calcium/barium/strontium. e. Cadmium and magnesium in tap water. 2. Nephelometric determinations 1. Sulphate 2. Phosphate 3. Silver 3. Spectroscopy a. Verification of Beer's Lambert Law. b. Determination of stoichiometry and stability constant of inorganic (e.g. ferric–salicylclic acid) and organic (e.g. amine-iodine) complexes, thiocynam.				

	c. Characterization of the complexes by electronic and IR, UV spectral data. Determination of Indicator constant (pKa) of methyl redin (i) aqueous and (ii) micellar media.
Course Outcome	On the completion of this course successfully student will be able to CO 1 : Determine the heavy metals with the help of Flame photometer. CO 2 : Nephelometric determinations of sulphate, phosphate and silver. CO 3 : Verification of Beer's Lambert Law. CO 4 : Determination of stoichiometry and stability constant of inorganic complex CO 5 : Determination of Indicator constant.
Text Books	1. Experiments and Techniques in Organic Chemistry, D.Pasto, C. Johnson and M.Miller, Prentice Hall. 2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heath. 3. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold. Handbook of Organic Analysis –Qualitative and Quantitative, H. Clark, Adward Arnold. 4. Vogel's Textbook of Practical Organic Chemistry, 5. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman.
Reference Books	1. Findley's Practical Physical Chemistry, B.P. Levi 2. Experimental Physical Chemistry, R.C. Das and B. Behera, Tata McGraw Hill. 3. Computer and Common Sense, R. Hunt and J. Shelley, Prentice Hall. 4. Computational Chemistry, A.C. Norris. 5. Microcomputer Quantum Mechanics, J.P. Killngbeck, Adam Hilger. 6. Computer Programming in FORTRAN IV, V. Rajaraman, Prentice Hall. 7. An Introduction to Digital Computer Design, V. Rajaraman and T. Radhakrishnan, Prentice Hall. 8. Experiments in Chemistry, D.V. Jahagirgar.

Two year Master of Science in Environmental Science programme
M.Sc. Environmental Science Semester-II
2022-2023

Course Title	**RESEARCH METHODOLOGY**				
Course Code	SMS05221P				
Course Credit	**L**	**T**	**P**	**TC**	
	2	**-**	**-**	**2**	
Prerequisite	**Basic Knowledge of research**				
Objective	• **Establish foundation to research in the respective domain.**				
Course Content	**UNIT I** Introduction, Biological data, Collection of data, Processing of data, Primary and Secondary data, Frequency distribution – Discrete and Continuous. Cumulative frequency distributions. **UNIT II** Diagrammatic and graphic representation of data: Advantages, Disadvantages; Types: Line diagram, Bar diagram, Pie Chart, Histogram, Frequency polygon, Frequency Curve. **UNIT III** Central tendency: Mean, Median, and Mode. Measures of dispersion – Standard Error, Standard deviation and Coefficient of Variations. Random Variable: Expectation and variance. **UNIT IV** Research Methodology: Introduction, Meaning, Objectives of Research, Motivation in Research, Types of Research, Significance of Research, Research Methods versus Research Methodology. **UNIT V** Research and Scientific Method, Process of Research, Criteria of Good Research, Limitations of Research, Research Problem: Definition, Selection and Techniques; Interpretation, Technique of Interpretation, Report writing.				
Course Outcome	On the completion of this course successfully student will be able to CO 1: understand the concepts and procedures of sampling, data collection, analysis and reporting. CO2: gain Knowledge about Diagrammatic and graphic representation of data CO3: use the appropriate statistical methods required for a particular research design CO4: understand various steps involved in conducting research. CO5: research design and develop appropriate research hypothesis for a research project				

Text Books	1. Research Methodology: Dr. V Upagade and Dr.Arvind Shende
Reference Books	1. Research Methodology: Methods and Techniques: C R Kothari