Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

Two Year Master of Science in Environmental Science Programme

M.Sc. EVS Semester-I

(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-I

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	SMS05101T	Foundation Course on Ecology and Environment	4	-	-	4	30	70	100	3.0
2	SMS05102T	Environmental Chemistry	4	-	-	4	30	70	100	3.0
3	SMS05103T	Environmental Toxicology, Health and Safety	4	-	-	4	30	70	100	3.0
4	SMS05104T	Instrumental Techniques: Principle and Application	4	-	-	4	30	70	100	3.0
5	SMS05181P	EVS Lab course: I	-	-	4	2	-	-	50	5.0
6	SMS05182P	EVS Lab Course: II	-	-	4	2	-	-	50	5.0
7	SMS05121T	Computer Application	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-I
2022-2023

<table>
<tr><td>Course Title</td><td colspan="5">FOUNDATION COURSE ON ECOLOGY AND ENVIRONMENT</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS05101T</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">Students must have the knowledge of basic concept of ecological and biological processes</td></tr>
<tr><td>Course Objective</td><td colspan="5">• To lay the foundation on basic concept of ecological and biological processes that ensures long-term stability of ecosystems.</td></tr>
<tr><td>Content</td><td colspan="5">UNIT-I
Principles of Ecology: Definition Principles and Scope of Ecology – Energy Flows, Ecological Pyramids, Types and Diversity, Food Chains and Food Webs. Homeostasis – Theories of Limiting Factors- Ecological Succession – Population and Communities- Reproductive Strategies- r and k Factors. Community Ecology- Structure, Species Diversity and Species Interaction.
UNIT-II
Ecosystem Ecology: Ecosystem- Structure- Components (Abiotic and biotic) and Functions of an Ecosystem. Ecosystem Types and Diversity- Terrestrial and Aquatic (Fresh water and Marine) Ecosystems. Ecotones - Concept of Edge Effect, Ecological NicheClassification Biomes - General Relationships Landscapes and Biomes – Climatic factors - Bio-geographical Regions of the World and Modern Biogeography.
UNIT-III
Ecological Imbalances: Human Ecology and Human Settlements- Evolution, Origin of life and Speciation -Population growth- Ecological Imbalances – Resources shortage – Earths carrying capacity – Man Engineered Ecosystems - Agriculture – Agro forestry – Biosphere Concept – Man and Biosphere – Future of the Biosphere
UNIT- IV
Ecological Applications: Sustainable Development- Ecological Sustainability- Organic Farming, Bio fertilizers and Bio pesticides - Integrated Pest Management (IPM) - Biological Monitoring of the Environment- Indicator species - Ecosystem Development- Theory of Human Ecology-Ecology of Space Travel- Types of Life Supporting Systems- Exobiology.
UNIT V
Ecosystem organization: Ecosystem structure and functions, primary production</td></tr>
</table>

	(methods of measurement, global pattern, controlling factors); energy dynamics (trophic organization, energy flow pathways, ecological efficiencies); litter fall and decomposition; mineral cycles in terrestrial and aquatic ecosystems Ecosystem management: Concepts; sustainable development; sustainability indicators.
Course Outcome	Develop foundation on principles of Environmental Science and concept of structure and function of different compartments of the Environment. Gain scientific perspective of the issues confronting our present day environment. Enable to analyze the national and global environmental issues relating to atmosphere, water, soil and land use, biodiversity, and natural resources (global warming, climate change, mineral extraction and energy resources, environmental impact assessment and environmental audit).
Text Books	1. Kendeigh S. G. 1961 Animal Ecology Prentice- Hall Inc. Englewood Cliffs, N. J, U.S.A. 2. Southwick C. H. 1972 Ecology and the Quality of Environment D. Van Nostard Company, London. 3. Edmund Hillary 1984 Ecology 2000 The Changing Face of Earth, Michel Joseph Ltd. London. 4. Sharma P. D. 1994 Ecology and Environment Rastogi Publications. Meerut. 5. Santra S. C. 2001 Environmental Sciences New Central Book Agency (P) Ltd. Calcutta.
Reference Books	1. Turk J and Turk A. 1984 Environmental Sciences 3rd Edn. Saunders College Publications. 2. Odum E. P. 1971 Fundamentals of Ecology 3rd Edn. W. B. Saunders Company London. 3. E.P. Odum and G.W. Barrett. 2005. Fundamentals of Ecology. Cengage Learning India Pvt. Ltd. 4. J.S. Singh, S.P. Singh and S.R. Gupta. 2008. Ecology, Environment & Resource Conservation. Anamaya Publications.

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

Course Title	**ENVIRONMENTAL CHEMISTRY**				
Course Code	**SMS05102T**				
Course Credit	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisite	Students must have the knowledge of fundamentals of various chemical processes.				
Course Objective	• To enable the students to understand the fundamentals of various chemical processes that form the core of important environmental problems and to apply the same in solving various environmental issues in polluted environments.				
Course Content	**UNIT-I** Concept and scope of environmental chemistry; atomic structure, their properties, electronic configuration, periodic properties of elements (ionization potential, electron affinity and electronegativity), types of chemical bonds (ionic, covalent, coordinate and hydrogen bonds); mole concept, molarity and normality, quantitative volumetric analysis. redox reactions, concepts of pH and pE, electrochemistry, Nernst equation, electrochemical cells **UNIT-II** Stochiometry, types of chemical reactions; acids, bases and salts, solubility products; solutes and solvents; solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, Radio nuclides. Basic concepts of organic chemistry, hydrocarbons, aliphatic and aromatic compounds, organic functional groups, polarity of the functional groups. Gasoline, antiknock compounds, lubricants and greases, biogas, PAH, PCBs, phenols, chlorofluorocarbons, pesticides, chemical fertilizers. **UNIT -III** Classification of elements, chemical speciation, Particles, ions and radicals in the atmosphere. Chemical processes for formation of inorganic and organic particulate matter. Laws of mass action and Applications, Le-Chatlier Braun principle. Principles of photochemistry, fluorescence, phosphorescence, photochemical and photosensitized reactions. Thermochemical and photochemical reactions in the atmosphere, Oxygen and ozone chemistry, Chemistry of air pollutants, greenhouse gases; Photochemical Smog, free radicals and ozone layer depletion, role of CFCs in ozone depletion. aerosols; chemistry of acid rain, reactions of NO_2 and SO_2 **UNIT-IV** First law of thermodynamics, enthalphy, adiabatic transformations, second law of thermodynamics, Carnot's cycle, entropy, Gibb's free energy, chemical potential, phase equilibria, Gibb's Donnan equilibrium, third law of thermodynamics,				

	enzymes catalysis, Michaelis/ Menten equation, exothermic and endothermic reactions, spontaneous and nonspontaneous reactions. **UNIT -V** Chemistry of water, alkalinity and acidity of water, hardness of water, concept of DO., BOD., and COD. Heavy metals, metal solubility, complexation and chelation. Wastewater treatment: Primary, Secondary and tertiary treatments. Advanced water treatment techniques, redox potential. Organic compounds -hydrocarbons, functional groups, nucleophiles and electrophiles. Surface and interface chemistry - Adsorption, absorption, catalysis, colloids, surfactants, examples, types of adsorption, desorption. Synthetic Polymers: biological decomposition, polymer decay, ecological consideration. Inorganic and organic components of soil, anion and cation exchange reactions in soil, nitrogen pathways and NPK in soils.
Course Outcome	• On the completion of this course successfully student gain detailed knowledge about various physico-chemical parameters, chemical reactions and removal/reduction of air, soil and water pollutants from the environment.
Text Books	1. Fundamental Concepts of Environmental Chemistry, Sodhi, G.S. (2009), Alpha Science International Ltd. 2. Environmental Chemistry, (5th Ed.), De, A. K. (2002), New Age International (P) Ltd. 3. Fundamentals of Environmental Chemistry, 3rd Edition, Manahan, E. S. (2011). CRC Press. 4. Photochemistry &Spectroscopy, Simons, J. P. (1971), Wiley Interscience. 5. Fundamentals of Photochemistry, Rohatgi-Mukherjee, K. K. (2006), New Age International (P) Ltd. 6. Elements of Environmental Chemistry, Jadhav, H. V. (1992), Himalya Publication House. 7. Environmental Chemistry, Sharma, B. K. and H. Kaur, H. (1994), Goel Publishing House 8. Environmental Chemistry, Moore, J. W. and Moore, E. A. (1976), Academic Press Inc
Reference Books	1. Environmental Chemistry A global perspective, (4th Ed.),VanLoon, G. W. and Duffy, S. J. (2017), Oxford University Press. 2. Chemistry of Atmospheres: An Introduction to the Chemistry of the Atmospheres of Earth, the Planets, and their Satellites (3rd Ed.), Wayne, R. P., (2000), Oxford University Press. 3. Basic Concepts of Environmental Chemistry (2nd edition), Connell, D.W. (2005), CRC Press. 4. Textbook of Environmental Chemistry, Pani, B. (2007), IK International Publishing House.

	5. Elements of Environmental Chemistry (2nd edition). Hites, R.A.(2012), Wiley & Sons. 6. Standard Methods for the Examination of Water and Waste Water, (23thEd.), APHA, 7. Mallon, K. 2006. Myths, Pitfalls and Oversights, Renewable Energy Policy and Politics: A Handbook for Decision-Making. Earth Scan.(2005), Washington, D.C. 8. Fundamentals of Soil Science, (8th Ed.), Futh, H. D. (2016), Wiley India. 9. Lehninger Principles of Biochemistry, (7th Ed.), Nelson, D. L. and Cox, M. M. (2017).W.H. Freeman & Co

Course Title	**ENVIRONMENTAL TOXICOLOGY, HEALTH AND SAFETY**

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

<table>
<tr><td>Course Code</td><td colspan="5">SMS05103T</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">Students must have the basic knowledge of Safety, Health and Environment.</td></tr>
<tr><td>Course Objective</td><td colspan="5">• Safety, Health and Environment in advance and establish foundation to research in the respective domain.</td></tr>
<tr><td>Course Content</td><td colspan="5">UNIT-I
Safety, Health and Environment: Perspectives and concerns, interrelationship and interactive approach, development projects and related aspects of safety and health, environment as the ultimate beneficiary / loser.
Safety and Health Hazards: Identification of potential safety and health hazards in industrial and development projects, reduction strategies, policies and legislation, international and national perspective, safety standards and management systems, ISO 18000. Industrial health safeguards and implementation mechanisms.
UNIT-II
Toxicology: Basic concepts, toxicity and its impacts, industrial toxicants and hazardous materials, toxic and hazardous waste management, measurement of toxicity, TLM and lethality studies, physiological and metabolic effects on flora and fauna.
UNIT-III
Evaluation of toxicity: Methods used to assess toxicity classification of toxic materials. Physiological and metabolic effects of toxicants, such as VOC and organic solvents, used in industry heavy metals such as Mg Cl, Cu, Pb, Al, AS, Zn, Mutagenic and carcinogenic compound. Anti cancer drugs.
UNIT-IV
Water and airborne Diseases: Potential and widespread effects, water and airborne bacteria and viruses, human immune-system and its vulnerability to these bacteria and viruses, preventive and curative measures, epidemics and their containment, biological warfare and protective measures. Safeguarding water sources and ambient air quality, disaster management.
UNIT-V
Health and Safety Risk Management: Risk identification, allocation and mitigation strategies, responsibilities and authority, potential of health risks in industrial and development processes, local and national policies, public awareness and participation in prevention procedures. Industrial environmental conditions, emissions and noise abatement.
Human Environment and Health Status in Urban and Rural India: Water and sanitation situation in urban and rural context, historical perspective, WHO and</td></tr>
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	other bodies and their role in public health projects development, eradication programs and their efficacy, development impacts in urban and rural sectors, psychological impacts, public awareness of sanitation and hygiene issues and role of NGOs.
Course Outcome	• On the completion of this course successfully student will be able to understand the Safety, Health and Environment
Text Books	1. Toxicology Vol I, II and III: Gupta, Metropolitan 2. Experimental toxicology : Anderson & Connings 3. Microbiology – Fundamentals and application R. M. Atlas, Maxwell-Mcmillan International Ed. 1996
Reference Books	1. Environmental Pollution and Toxicology: Ray Choudhury & Gupta, Today & Tomorrow Publ. 2. Toxicology, Omkar. 3. Toxicology, Sood , Sarup and Sons.

Course Title	**INSTRUMENTAL TECHNIQUES: PRINCIPLE AND APPLICATION**

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

Course Code	**SMS05104T**				
Course Credit	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisite	Students must have the knowledge of interaction between light and matter and quantum mechanics.				
Course Objective	• Spectroscopy Chemistry in advance and establish foundation to research in the respective domain.				
Course Content	**UNIT -I** **Unifying Principles:** Electromagnetic radiation, interaction of electromagnetic radiation with matter absorption, emission transmission, reflection, dispersion, polarization and scattering, Uncertainty relation and natural line width and natural line broadening, transition probability, selection rules, intensity of spectral lines, Born-Oppenheimer approximation, rotational, vibrational and electronic energy levels. **UNIT -II** **Microwave Spectroscopy:** Classification of molecules in term of their internal rotation mechanism, determination of rotation energy of diatomic and polyatomic molecules, intensities of rotational spectral lined, effect of isotopic substitution on diatomic and polyatomic molecules, intensities of rotational spectral lines and parameters of rotational energy of linear and the transition frequencies, non-rigid rotators, spectral lines and parameters of rotational energy of linear and symmetric top polyatomic molecules. Application in determination of bond length. **UNIT- III** **Scattering Spectroscopy:**-Principle, instrumentations and application of Auger spectroscopy and Scanning Electron Microscopy for chemical characterization, electron diffraction of gases and vapours, The Wierl equation and co- related method, application of electron diffraction. Theory, instrumentation and application of turbidimetry, nephelometry and fluorometry. Fluoroscence and phosphorescence and factors affecting them. **UNIT -IV** **Raman Spectroscopy**:-Classical and quantum theories of Raman effect, pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules mutual exclusion principle, Resonance Raman spectroscopy, Coherent anti Stokes Raman spectroscopy (CARS), Instrumentation , Application of Raman effect in molecular-structures, Raman activity of molecular vibration, structure of CO_2, N_2O, SO_2, NO_3 , CIF_3 **UNIT -V** **X-ray Diffraction:** Bragg condition, Miller indices, Laue Method, Bragg				

	method, Debye Scherrer method of X-ray structural analysis of crystals, index reflections, identification of unit cells from systematic absences in diffraction pattern, Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules, Ramcharan diagram. **Electron Diffraction:** Scattering intensity vs. scattering angle, Wierl equation, measurement technique, elucidation of structure of simple gas phase molecules. Low energy electron diffraction and structure of surfaces. **Neutron Diffraction :** Scattering of neutrons by solids and liquids, magnetic scattering, measurement techniques. Elucidation of structure of magnetically ordered unit cell.
Course Outcome	• On the completion of this course successfully student will be able to understand the development of the 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, IBH Oxford. 4. Introduction to Photoelectron Spectroscopy, P.K. Ghosh, John Wiley. 5. Introduction to Magnetic Resonance. A Carrington and A.D. Maclachalan, harper & Row.

Course Title	**EVS LAB COURSE: I**

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

<table>
<tr><td>Course Code</td><td colspan="5">SMS05181P</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>-</td><td>-</td><td>2</td><td>2</td><td></td></tr>
<tr><td>Prerequisite</td><td colspan="5">Students must have the practical knowledge of chemical analysis for inorganic and organic molecules.</td></tr>
<tr><td>Course Objective</td><td colspan="5">• To understand the practical concepts of inorganic and organic chemistry</td></tr>
<tr><td>Course Content</td><td colspan="5">1. Determination of dissolved oxygen of water samples.
2. Determination of reduction potential of water samples.
3. Determination of total dissolved solid of water samples.
4. Determination of hardness of water samples.
5. Determination of alkalinity of water samples.
6. Determination of COD and BOD value of water samples.
7. Determination of color value of waste water.
8. Determination of organic carbon (OC) content of water.
9. Determination of microbe content of water.</td></tr>
<tr><td>Course Outcome</td><td colspan="5">• On the completion of this course successfully student will be able to understand practical of inorganic chemistry and organic chemistry. .</td></tr>
<tr><td>Text Books</td><td colspan="5">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.</td></tr>
<tr><td>Reference Books</td><td colspan="5">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.
5. Findlay’s Practical Physical chemistry, revised B</td></tr>
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Two year Master of Science in Environmental Science programme
M.Sc. Environmental Science Semester-I
2022-2023

Course Title	**EVS LAB COURSE:II**
Course Code	**SMS04182P**

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

Course Credit	**L**	**T**	**P**	**TC**	
	-	**-**	**2**	**2**	
Prerequisite	Students must have the practical knowledge of handling spectroscopy and physical chemistry experiment.				
Course Objective	• To understand the practical concepts of spectroscopy and physical chemistry				
Course Content	1. Conductometry a. Determination of the velocity constant, order of the reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductometrically. b. Determination of solubility and solubility product of sparingly soluble salts (e.g., PbSO4, BaSO4) conductometrically. c. Determination of pKa of Acetic acid and verification of Ostwald dilution law. 2. Potentiometry/pH metry a. Determination of the strength of strong and weak acids in a given mixture using a potentiometer/pH meter. b. Determination of the dissociation constant of acetic acid in DMSO, DMF, acetone and dioxane by titrating it with KOH. c. Determination of the dissociation constant of monobasic/dibasic acid by Albert-Serjeant method. d. Determination of Redox potential of Fe++/Fe+++ system. 3. Polarimetry a. Determination of rate constant for hydrolysis/inversion of sugar using a polarimeter. b. Enzyme kinetics –inversion of sucrose. c. Determine the specific and molecular rotation of optically active substances.				
Course Outcome	• On the completion of this course successfully student will be gain the practical knowledge for performing the experiments of spectroscopy and physical and analytical chemistry laboratory work.				
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. 6. Findley's Practical Physical Chemistry, B.P. Levi
Reference Books	1. Experimental Physical Chemistry, R.C. Das and B. Behera, Tata McGraw Hill. 2. Computer and Common Sense, R. Hunt and J. Shelley, Prentice Hall. 3. Computational Chemistry, A.C. Norris. 4. Microcomputer Quantum Mechanics, J.P. Killngbeck, Adam Hilger. 5. Computer Programming in FORTRAN IV, V. Rajaraman, Prentice Hall. 6. An Introduction to Digital Computer Design, V. Rajaraman and T. Radhakrishnan, Prentice Hall.Experiments in Chemistry, D.V. Jahagirgar.

Course Title	**COMPUTER APPLICATION**				
Course Code	**SMS04121T**				
Course	**L**	**T**	**P**	**TC**	

Credit	**2**	**-**	**-**	**2**	
Prerequisite	Students must have the basic knowledge of computer and Environment				
Objective	• Computers for Environment in advance and establish foundation to research in the respective domain.				
Course Content	**UNIT-I** Computer Basics, Introduction to computer networks, LAN, MAN, WAN & Internet, Internet applications. Introduction to MS office, working with documents, worksheets and presentations **UNIT-II** Concepts of Programming languages, Introduction to 'C' language, flowcharts and algorithms, introduction to data structure and database concepts, Object oriented concepts. **UNIT-III** Introduction to Chemoinformatics: History and evolution of chemoinformatics, Use of chemoinformatics, Prospects of chemoinformatics, Molecular Modelling and Structure elucidation. **UNIT-IV** **Representation of molecules and chemical reactions:** Nomenclature, Different types of notations, SMILES coding, Matrix representations, Structure of Molfiles and Sdfiles, Libraries and toolkits, Different electronic effects, Reaction classification, **Searching chemical structures:** Full structure search, sub-structure search, basic ideas, similarity search, three dimensional search methods, basics of computation of physical and chemical data and structure descriptors, data visualization. **UNIT-V** **Applications:** Prediction of Properties of Compounds; Linear Free Energy Relations; Quantitative Structure-Property Relations; Descriptor Analysis; Model Building; Modeling Toxicity; Structure-Spectra correlations; Prediction of NMR, IR and Mass spectra; Computer Assisted Structure elucidations; Computer Assisted Synthesis Design, Introduction to drug design; Target Identification and Validation; Lead Finding and Optimization; Analysis of HTS data; Virtual Screening; Design of Combinatorial Libraries; Ligand-Based and Structure Based Drug design; Application of Chemoinformatics in Drug Design.				
Course Outcome	• On the completion of this course successfully student will be able to understand the development of computers for chemists				
Text Books	1. Let us learn C : Yashwant Kanetkar 2. Mastering C: Venugopal 3. Gasteiger, J. & Engel, T. (2003) Chemoinformatics: A text-book. Wiley-				

	VCH.
Reference Books	1. Andrew R. Leach & Valerie , J. Gillet (2007) An introduction to Chemoinformatics. Springer: The Netherlands. 2. Gupta, S. P. (2011) QSAR & Molecular Modeling. Anamaya Pub.: New Delhi.