



Deccan Education Society's

Fergusson College (Autonomous), Pune

Program Specific Outcomes(PSOs) and Course Outcomes (COs) 2019-20

Department of Environmental Science

Programme: M.Sc. Environmental Science

PSO No.	Program Specific Outcomes(PSOs) Upon completion of this programme the student will be able to
PSO1	Academic competence: (i) Understand fundamental concepts, principles and processes underlying the field of Environmental Science, its interdisciplinary nature and create and disseminate knowledge to the students about environmental problems at local, regional and global scale. (ii) Demonstrate an understanding of a wide range of Environmental techniques (e.g. basic water and soil analysis, microbiological methods, spectrophotometry, GIS based analysis, Ecological data analysis, Bio-assays, statistical data analysis and its applications, mathematical modelling.
PSO2	Personal and Professional Competence: (i) Carry out laboratory-orientated numerical calculations and be capable in data visualization and interpretation. related to Environmental Science, atmospheric science, Climatology, GIS and Remote sensing. (ii) Analyse Environmental data (e.g. in Natural Resource Management, Habitat analysis and biological databases, watershed Management, Environmental pollution and its control. (iii) Formulate ideas, write scientific reports, demonstrate effective presentation, communication skill and standard practices of environmental protection.
PSO3	Research Competence: (i) Apply environmental data analysis methodology in order to conduct research and demonstrate appropriate skill to seek innovative solutions to problems that emerge in various fields of Ecology and Environmental Science and interdisciplinary fields like Green Technology, Biotechnology etc (ii) Integrate informatics and statistical skills to explore and authenticate biological data for experimental and research purpose.
PSO4	Entrepreneurial and Social competence: (i) Employ skills in specific areas related to Environmental Science such as industrial pollution, Green technology development, Ecological, health,

	<p>agriculture and ensure multilevel commitment to health and well being of the society at large.</p> <p>(ii) Exhibit awareness of environmental and ethical issues: emphasizing on academic and research ethics, scientific misconduct, intellectual property rights and issues of plagiarism.</p> <p>(iii) Demonstrate capability for developing sustainable societies and understand national and international environmental policies and programmes and their implementation strategies.</p>
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F.Y. M.Sc. Semester I

Title of the Course and Course Code	Environmental Biology (EVS4101)	Number of Credits: 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe different types of theories of Ecology and its applications. Examine different measures to remediate ecosystems by natural recovery.	1
CO2	Discuss the importance of different biotic, abiotic components of the ecosystem and relate it to environment protection and conservation issues. Articulate different interactions among the interspecific and intraspecific species.	2
CO3	Apply the knowledge to study characters of population and community and recognize environmental issues associated with it.	3
CO4	Identify synthetic characters of community by connecting environmental variables.	4
CO5	Review key challenges posed by developmental activities on natural processes and integrate modern day techniques to solve various problems at local, regional level to attain far-reaching goal of sustainability.	5
CO6	Specify the importance of life sustaining processes on Earth and integrate them in planning and development for innovative solutions. Design experiments to understand types of processes and different concepts.	6
Title of the Course and Course Code	Environmental Chemistry (EVS4102)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe concepts, goals, principles, tools used in Green chemistry. Recall concept of Synthetic polymers, PCBs, Heavy metals and Chemical pesticides. Identify environmental issues associated with these contaminants with reference to their quality and quantity.	1
CO2	Classify Soaps, Detergents and discuss consequences, prevention and control of pollution caused by them. Describe concepts of Eutrophication and associated problems.	2
CO3	Demonstrate different techniques used for destruction of hazardous substances.	3
CO4	Compare different instrumentation techniques to estimate environmental parameters and identify the better methods for analysis for environmental contaminants. Differentiate point, nonpoint sources of pollutants and discuss consequences of criteria pollutants.	4
CO5	Evaluate the best practices in measurement of environmental pollutants. Appraise different tests to understand the validation of the methods for environmental parameters from air, water and soil.	5

CO6	Develop skills to aware the community for importance of soil, water based on scientific knowledge and specify soil quality in the different study areas.	6
Title of the Course and Course Code	Environmental Geo and Atmospheric Science (EVS4103)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline the concepts, key terms of environmental geology and atmospheric sciences.	1
CO2	Explain the phenomenon, parameters related to environmental geological and atmospheric processes and discuss their importance.	2
CO3	Execute methods to study environmental geological and atmospheric processes.	3
CO4	Compare environmental geological and atmospheric processes. Illustrate the role of geo and atmospheric concepts towards specific functions of earth as a system.	4
CO5	Determine the environmental geological and atmospheric processes.	5
CO6	Specify concepts and write a report on environmental geological and atmospheric processes.	6
Title of the Course and Course Code	Environmental Science Practical - I (EVS4104)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify different associations and interactions among the species. Describe basic concepts of environmental biology and chemistry.	1
CO2	Explain the interactions among the species loss, anthropogenic issues and articulate environmental chemistry.	2
CO3	Demonstrate methods used for sterilization, media preparation and staining of bacteria. Calculate different indices used in vegetation studies and apply them for data analysis.	3
CO4	Organize data obtained through field work, online portals and secondary data and relate it with spatio-temporal aspects.	4
CO5	Evaluate different water quality parameters and compare with different water quality standards.	5
CO6	Develop skills to assess biological aspects of environment in laboratory and on field. Design a field survey with objectives to study environmental biology and environmental chemistry of the region.	6
Title of the Course and Course Code	Environmental Science Practical - II (EVS4105)	Number of Credits : 04

On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe the basic concepts of processes and experiments related to geological, atmospheric processes and environmental chemistry.	1
CO2	Illustrate different geological, atmospheric processes and environmental chemistry.	2
CO3	Apply the knowledge to study watershed characteristics and weather processes. Carry out experiments to analyse the characteristic water, air and soil.	3
CO4	Analyse different types of rocks and minerals on basis of their physical properties. Analyse data to prepare Wind rose.	4
CO5	Determine important geological and atmospheric processes used in environmental laboratories and conclude the results obtained by using different methods. Measure different parameters of geological and atmospheric processes based on toposheets and climographs.	5
CO6	Prepare maps of hazard zones. Generate a report on different field visits.	6

F.Y. M.Sc. Semester II

Title of the Course and Course Code	EIA and Environmental Audit (EVS4201)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe basic concepts in the field of environmental conservation.	1
CO2	Discuss the scope, importance, opportunities in Environmental Impact Assessment (EIA) practices in relation with sustainable development aspects to connect the global, national and regional issues and interpret the reports. Outline Administrative requirements and policies as per government guidelines.	2
CO3	Calculate details about environmental impact assessment studies along with case studies for different developmental activities. Categorize methods for accurate prediction and interpretation of the future impacts due to ongoing developmental projects.	3
CO4	Compare practices followed in different countries about EIA for better understanding of the environmental processes. Identify the best practices, guidelines followed in view of sustainable development.	4
CO5	Evaluate formats, techniques required to assess impacts and perform audits for protection of environment.	5
CO6	Prepare a report on the industry specific requirements for environmental management system and environmental audit.	6
Title of the Course and Course Code	Water and Wastewater Treatment Technology (EVS4202)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive

		level
CO1	Define the key terms in water and wastewater engineering. Tell physical, chemical, biological impurities in water.	1
CO2	Explain different water quality standards for effluent discharge, irrigation and drinking purposes. Predict the role of each unit operation in water treatment plant.	2
CO3	Integrate the role of coagulants and flocculants in wastewater treatment. Use different population forecasting methods.	3
CO4	Compare water treatment methods for removal of impurities and differentiate between working principles of unit operations of water treatment plants.	4
CO5	Select the appropriate unit operations for water treatment and evaluate the performance of each unit operation.	5
CO6	Design Sewage/Effluent Treatment Plan (STP/ETP) based on characteristics of wastewater.	6
Title of the Course and Course Code	Biodiversity, Forestry and Conservation (EVS4203)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define and state the concepts of Biodiversity at different levels.	1
CO2	Discuss concepts and working in forestry and agrobiodiversity. Explain the values of Biodiversity and its importance.	2
CO3	Demonstrate Inventory of Global and National Bio resources.	3
CO4	Analyse conservations actions at International, National and Local levels. Compare in-situ and ex-situ conservation practices. Relate the importance of people participation in protected area management.	4
CO5	Select sampling methods for data collection and review the field data using different statistical techniques.	5
CO6	Plan and conduct independent field surveys.	6
Title of the Course and Course Code	Environmental Science Practical - III (EVS4204)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify physical, chemical properties of sewage.	1
CO2	Illustrate primary, secondary impacts due to developmental activities and nature, structure of formats required by Government agencies.	2
CO3	Calculate and examine performance of water, wastewater treatment plants.	3
CO4	Explain the working of unit operations of water and wastewater treatment plants.	4
CO5	Determine the environmental aspects, impacts of the industry with the help of tools of Environmental Management System (EMS).	5
CO6	Prepare flowcharts, network diagrams, Leopold matrix, checklist	6

	as a part of impact assessment techniques, video documentaries, collect field data for environmental impacts with use of online softwares and advanced techniques to write the reports. Design water treatment plants.	
Title of the Course and Course Code	Environmental Science Practical - IV (EVS4205)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe potability of water based on data obtained by evaluation of water quality parameters.	1
CO2	Compare water quality data obtained from laboratory analysis with water quality standards.	2
CO3	Carry out biodiversity assessment of the area.	3
CO4	Analyse level of environmental pollutants and investigate a dose of coagulants, disinfectants for the treatment of wastewater.	4
CO5	Select the field survey techniques to monitor different taxa.	5
CO6	Write a report on field visits. Compile Community Biodiversity Register. Develop ecotourism plan for the protected area and Joint forest Management for a local area.	6
S.Y. M.Sc. Semester III		
Title of the Course and Course Code	Environmental Statistics (EVS5301)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe concept of population and sample in Environmental statistics, distinguish between different ways used for data sampling.	1
CO2	Classify data in the form of a frequency distribution table. Articulate variables in diagrammatic and graphical form.	2
CO3	Compute measures of dispersion with the help of suitable tools. Apply suitable softwares for assessment of environmental variables	3
CO4	Identify discrete, continuous distributions for probability assessment. Analyse probabilities with the help of different distribution methods.	4
CO5	Evaluate Environmental datasets and calculate its central component.	5
CO6	Construct different indices by using tools of statistics.	6

Title of the Course and Course Code	Remote Sensing and GIS (EVS5302)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Recall basics of Electromagnetic radiation and Spectrum. Describe basic concepts, principles and processes of Remote sensing and GIS.	1
CO2	Discuss satellites in space and their applications.	2
CO3	Demonstrate map projection methods to understand its importance and limitations. Apply the techniques to address real life field issues using different softwares.	3
CO4	Compare Raster data, Vector data in GIS to recognize its role in generating information about different features on the earth and distinguish spatial data and Non-spatial data to understand characteristics and represent the earth features.	4
CO5	Select classification method, interpret satellite images visually and digitally judge the accuracy level of classified maps.	5
CO6	Develop spatial thinking in GIS by using geo-processes and functions. Collect GIS data to study recent advances.	6
Title of the Course and Course Code	Climate Change and Sustainability (EVS5303)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify, list environmental, social, and economic impacts of anthropogenic activities and required sustainability framework for mitigation.	1
CO2	Discuss the anthropogenic and natural drivers of climate change and future developments aspects for sustainability. Outline scope, importance, and opportunities for climate change and sustainability studies.	2
CO3	Calculate environmental impacts for different development projects by using common methodologies.	3
CO4	Analyze the impacts of climate change and compare with future goals of sustainability. Compare different policies and agreements regarding climate change and developmental goals.	4
CO5	Evaluate the impacts of climate change and sustainability by appropriate tools and techniques.	5
CO6	Compile the data and prepare reports by using different methods about climate change and sustainable practices.	6

Title of the Course and Course Code	Environmental Issues (EVS5304)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline the important local and regional environmental issues.	1
CO2	Discuss reasons, practices behind important environmental issues at the global, national and local level.	2
CO3	Calculate the impacts of the issues by using different methods and classify unique approaches towards the solution of the issues in different societies.	3
CO4	Compare the practices followed for solution of environmental issues in different societies and relate them with national practices.	4
CO5	Compare and evaluate the strengths of advanced techniques and traditional practices to minimize impacts on the environment.	5
CO6	Prepare a plan for identification of local environmental issues and collect data to write a report about the solution of these issues.	6
Title of the Course and Course Code	Summer Training (EVS5306)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline the concepts, basic scientific principles of different environmental parameters. Identify and tabulate the tasks to be performed as part of summer training in an organization.	1
CO2	Explain techniques used in working for environmental management during training.	2
CO3	Implement theoretical, practical knowledge gained from curriculum in the field and gain skills for environmental management and conservation.	3
CO4	Analyse environmental variables with help of different tools, systems and apply them on field.	4
CO5	Measure the effectiveness of conservation action plans for a particular region.	5
CO6	Prepare a project report. Propose an effective treatment method for better management of the environmental issues.	6
Title of the Course and Course Code	Practical 5 (EVS5307)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline distribution of frequencies in sample.	1
CO2	Classify environmental data with the help of suitable statistical methods and illustrate it by using software	2
CO3	Illustrate the spatial data using attribute query or spatial query. Use	3

	vector data layers to form maps.	
CO4	Analyse geo-spatial datasets. Relate the spatial and non-spatial data to create links between them. Explain the satellite data visually and digitally using softwares.	4
CO5	Review and evaluate the impacts of the local and regional climatic system, carbon footprint and sustainability.	5
CO6	Collect long term data for solutions to the environmental issues and prepare a final report with scientific techniques. Develop practical skills in using RS and GIS softwares.	6

S.Y. M.Sc. Semester IV

Title of the Course and Course Code	Environmental Law Ethics Policies (EVS5401)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify important provisions of Environmental laws in India and international agreements.	1
CO2	Discuss about important provisions of environmental laws in India and international agreements. Explain the differentiation in policies of different societies.	2
CO3	Carry out critical examination of the different legal case studies from India and abroad. Solve the examples based on provisions of the environmental laws.	3
CO4	Explain the role of the constitution and different administrative mechanisms.	4
CO5	Review the Environmental ethics and justify challenges associated with it.	5
CO6	Compile legal requirements of policies related to different natural resources.	6

Title of the Course and Course Code	Environmental Management Systems (EVS5402)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Recall basic concepts, principles in relation with environmental management. Identify the close relation between standard practices of management and development of standards.	1
CO2	Explain important guidelines of Environmental management system standards.	2
CO3	Identify environmental problems and apply appropriate knowledge, skills to selected case studies or real-life situations.	3
CO4	Interpret and present EMS related data using different qualitative and quantitative techniques.	4
CO5	Evaluate concept of circular economy and its role in sustainable development.	5
CO6	Prepare reports based on different judgements and implementation in different parts of society. Collect and compile the surveys in relation with standard environmental management practices in different organizations.	6

Title of the Course and Course Code	Restoration and Watershed Management (EVS5404)	Number of Credits: 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the different types of theories of Restoration and its application.	1
CO2	Estimate the importance of interconnection between biotic, abiotic components of the ecosystem and relate it to environment protection and conservation issues through watershed management practices.	2
CO3	Examine different examples of restoration practices as well as watershed management projects and perform different pilot studies related to it and recognize environmental issues associated with it.	3
CO4	Analyse cost benefit analysis of restoration projects. Revise and evaluate restoration practices.	4
CO5	Evaluate key challenges posed by developmental activities on natural processes and integrate restoration day techniques to solve different problems at local and regional level to attain a far-reaching goal of sustainability.	5
CO6	Design experiments to understand different types of processes and concepts used in Environmental Biology.	6
Title of the Course and Course Code	Green Technologies (EVS5405)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Recall different types of green technologies by giving examples. Examine and interpret different methods of green techniques.	1
CO2	Illustrate the importance of reduce, reuse, recycle and classify different techniques associated to environment protection and conservation issues through green practices.	2
CO3	Examine different examples of green practices with respect to Green cities. Distinguish between practices of Green city policy and recognize Environmental, economical, social well-being associated with it.	3
CO4	Analyse cost benefit analysis and propose an Energy audit at the institutional level. Revise and evaluate green practices for Rural development.	4
CO5	Compare key challenges posed by green technologies and develop key solutions to the different environmental problems at local and regional levels.	5
CO6	Design experiments to understand different types of processes and concepts used in Green technologies. Evaluate the importance of green chemistry and energy efficient technologies and integrate them in planning and development for innovative solutions.	6

Title of the Course and Course Code	Environmental Health, Toxicology and Safety (EVS5407)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Recite the basic concepts in Environmental Health, Toxicology and Safety. List out and recall the scientific principles of these topics.	1
CO2	Illustrate the role and responsibilities of an occupational health and safety practitioner. Clarify the policies and legislation on safety in industries and workplace environments. Describe concepts of Biological warfare and protective measures.	2
CO3	Determine Toxicity testing methods and interpret the toxicity of Industrial toxicants and hazardous materials. Use epidemiological case studies for real time understanding of different aspects.	3
CO4	Estimate Toxicity of different toxicants based on the concept of Toxicokinetics and Toxicodynamics. List and memorize various Parameters of toxicity testing.	4
CO5	Evaluate the toxicity level of toxicants depending on the Interaction of toxicants in combination. Describe concept of Mutagens, Teratogens and Carcinogen and identify the source and effects of these materials.	5
CO6	Design an experiment to study the exact dose of toxicity on the selected test organism aspects. Develop protocol for toxicity testing.	6
Title of the Course and Course Code	Energy Resources and Technologies (EVS5408)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Recall concepts of renewable and non-renewable energy resources, its importance and limitations. Outline methods of harnessing renewable energy and their global availability.	1
CO2	Describe the basic principles and technologies to harness various energy resources. Discuss the merits and demerits of energy generation technologies.	2
CO3	Develop energy generation process using lab scale models of biogas plant, wind mills, solar devices.	3
CO4	Analyze advanced technologies available for energy harnessing by using different methods.	4
CO5	Evaluate appropriate energy harvesting techniques based on its availability, importance and technological and ecological and economical aspects, Judge the future potential of renewable energy resources.	5
CO6	Design a method to study biogas production. Develop protocol to work on biomass conversion process.	6

Practical 6 (EVS5410)		
Title of the Course and Course Code	Practical 6 (EVS5410)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	State Environmental management system tools and select suitable tools like LCA, Environmental Audit for natural resource conservation.	1
CO2	Discuss the challenges associated with environmental governance in India and overall challenges in different societies. Compare various issues associated with implementation of environmental management at national and international level.	2
CO3	Outline the features on toposheets. Analyze the watershed for length, area and perimeter, measure the slope of watershed. Construct the longitudinal profile of river.	3
CO4	Compare processes and behavior of green techniques with different species and varieties. Collect information and studies with proper understanding. Specify the role towards function.	4
CO5	Evaluate toxicity level of toxicants from different sources on the selected test organisms. Relate the response of test organisms towards the dose of toxicant of industrial waste.	5
CO6	Design simple and innovative energy making instruments for rural areas, questionnaire for inspection of solar home systems.	6
Dissertation (EVS5411)		
Title of the Course and Course Code	Dissertation (EVS5411)	Number of Credits : 04
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the need for selection of project work in relation to the current environmental topics as per social aspects. Recall techniques, basic terms related to research topics and research work.	1
CO2	Classify the basic concepts in research to implement the dissertation. Associate the objectives as per topic of research in the environmental field. Compare different research implementation ways as per other research workers.	2
CO3	Apply the objectives of the work to solve the issues of the society. Calculate the impacts on the environment by using well known methods.	3
CO4	Analyse research-oriented approach to solve environmental issues and test it with the help of innovating solutions.	4
CO5	Compare techniques used in restoration studies. Outline the outcomes of restoration projects.	5

CO6	Design an experimental setup and develop lab scale model to generate data and interpret it for solving environmental problems. Develop protocol to work on the selected dissertation topic for systematic research work.	6
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