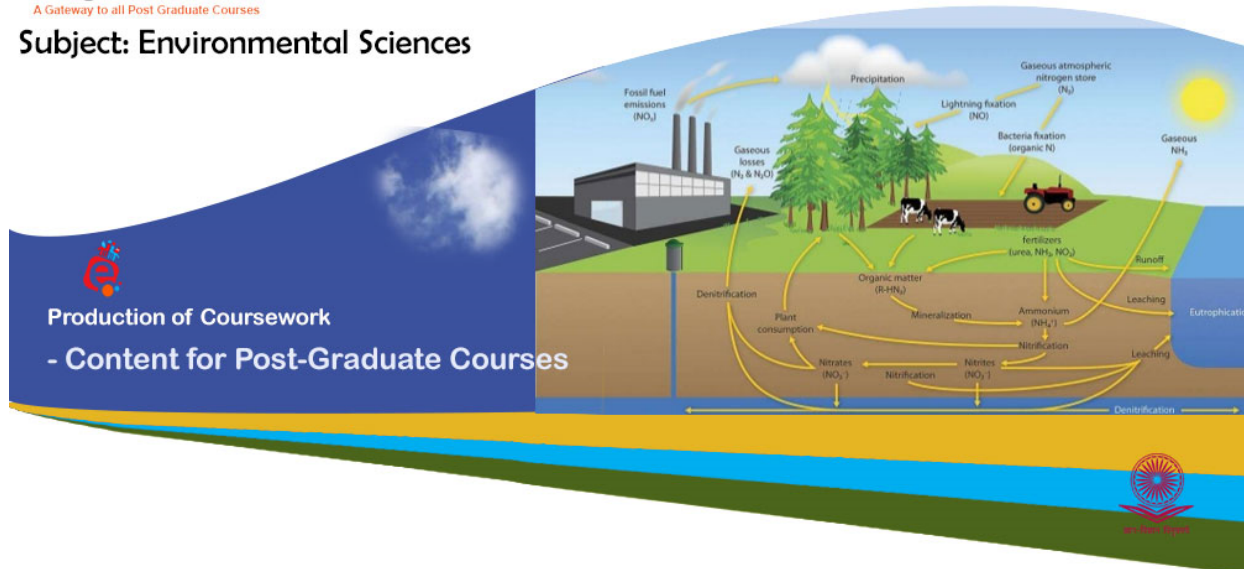


Subject: Environmental Sciences



Production of Coursework
- Content for Post-Graduate Courses



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Total Number of Modules Developed - 530

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Paper 1
Ecosystem structures & functions

Paper Coordinator : Dr. Renuka Gupta, YMCA University of Science and Technology, Faridabad, Haryana

Module No.	Module	Content writer
MODULE 1	Ecosystems: Concept, Structure and Functions PART I	Dr. Renuka Gupta
MODULE 2	Ecosystems: Concept, Structure and Functions PART II	Dr. Renuka Gupta
MODULE 3	Ecosystems: Concept, Structure and Functions Part III	Dr. Renuka Gupta
MODULE 5	Food chains and Food webs	Dr. Renuka Gupta
MODULE 6	Ecological Pyramids	Dr. Renuka Gupta
MODULE 7	Energy Flow in Ecosystem: Energy Flow Models	Dr. Renuka Gupta
MODULE 19	Ecological Succession – Part 1	Dr. Renuka Gupta
MODULE 20	Ecological Succession–Part-2	Dr. Renuka Gupta
MODULE 21	Biomes- concept and classification	Dr. Sharda R. Gupta
MODULE 22	Earth's Major Biomes: Distribution and Biotic Components	Dr. Sharda R. Gupta
MODULE 23	Ecosystem Structure and Functions	Dr. Sharda R. Gupta
MODULE 24	Types of Ecosystem	Dr. Vandana Sharma,
MODULE 25	Forest ecosystem: Forest Types of India	Dr. Sharda R. Gupta
MODULE 26	Desert Ecosystem	Dr. Sharda R. Gupta
MODULE 27	Grassland Ecosystem	Dr. Sharda R. Gupta
MODULE 30	Types of Aquatic Ecosystems- I : Freshwater Ecosystem	Dr. Sharda R. Gupta
MODULE 31	Types of Aquatic Ecosystems-II: Marine Ecosystem	Dr. Sharda R. Gupta
MODULE 38	Ecosystem management at national and international level	Dr. Vandana Sharma

Paper 2

Analytical Chemistry

**Paper Coordinator : Dr. J. N. Babu, Central University of Punjab,
Bathinda**

Module No.	Module Title	Content writer
MODULE 01	General Analytical	Dr. Varinder Kaur
MODULE 02	Errors in analysis and laboratory safety	Dr. Varinder Kaur
MODULE 03	Volumetric Analysis	Dr. Meenu
MODULE 05	Complexometric Titrations Development	Dr. Meenu
MODULE 06	Redox Titrations	Dr. Meenu
MODULE 07	Precipitation(Argentometric) Titrations Development	Dr. Meenu
MODULE 08	Gravimetric Analysis	Dr. Meenu
MODULE 18	Mass Spectrometry	Dr. Heena Rekhi
MODULE 20	Bomb Calorimetry	Dr. J. N. Babu
MODULE 23	Potentiometry	Dr. Heena Rekhi
MODULE 24	pH electrode, membrane electrode, biochemical electrode, ISFET, MOSFET	Dr. Heena Rekhi
MODULE 25	Conductivity meter and Salinity meter	Dr. Heena Rekhi
MODULE 26	DO meter	Dr. Heena Rekhi
MODULE 27	Polarography	Dr. Heena Rekhi
MODULE 28	Anodic and Cathodic stripping voltammetry	Dr. Heena Rekhi and Neha Sharma
MODULE 29	Cyclic Voltammetry	Dr. Heena Rekhi and Neha Sharma
MODULE 32	General Chromatography : Distribution Coefficient and its implications	Dr. Varinder Kaur
MODULE 33	Chromatographic methods: Paper, TLC and Column chromatography	Dr. Varinder Kaur
MODULE 34	High performance thin layer chromatography (HPTLC)	Dr. Varinder Kaur
MODULE 35	Gas Chromatography (GSC and GLC), Technique and Sample preparations	Dr. Varinder Kaur
MODULE 36	Gas chromatography-mass spectrometry	Dr. Varinder Kaur
MODULE 37	High pressure liquid chromatography	Dr. Varinder Kaur

MODULE 38	Ion exchange chromatography	Dr. Varinder Kaur
MODULE 39	Ion/Molecular Exclusion chromatography	Dr. Varinder Kaur
MODULE 40	Capillary Electrophoresis	Dr. Varinder Kaur

Paper 3

Biodiversity and conservation

**Paper Coordinator : Prof. Daizy R. Batish, Department of Botany,
Panjab University, Chandigarh**

and

**Dr. Sunil Mittal Department of Environment Science and
Technology, Central University of Punjab, Bathinda**

Module No.	Module Title	Content writer
MODULE 01	Biodiversity and Environmental Conservation-I	Dr. Sunil Mittal and Dr. Hardeep Kaur
MODULE 02	Biodiversity and Environmental Conservation-II	Dr. Sunil Mittal and Dr. Hardeep Kaur
MODULE 03	Values and uses of biodiversity	Dr. Felix Bast
MODULE 04	Current Status of Biodiversity in India-2	Dr. Sunil Mittal
MODULE 05	Current Status of Biodiversity in India-3	Dr. Sunil Mittal
MODULE 06	Biodiversity Characterization and Inventoring: Taxonomic Approach	Dr. Felix Bast
MODULE 09	Animal Diversity: Origin and Classification	Dr. R.K. Chaitanya
MODULE 10	Process of Speciation	Dr. Felix Bast
MODULE 11	Insect Biodiversity	Dr. R.K. Chaitanya
MODULE 12	Freshwater Biodiversity: Spatial Patterns	Dr. Felix Bast
MODULE 13	Microbial biodiversity	Prof. Daizy R. Batish
MODULE 14	Agrobiodiversity	Dr. Sunil Mittal
MODULE 15	Hot Spots of Biodiversity	Prof. Daizy Batish
MODULE 11	Marine Biodiversity: Spatial Patterns	Dr. Felix Bast
MODULE 17	Temporal Patterns of Biodiversity: Ecological to Geological Scale	Dr. Felix Bast
MODULE 18	Threats to Biodiversity	Prof. Daizy R. Batish
MODULE 19	Biological Invasion	Prof. Daizy R. Batish
MODULE 20	Causes of Species Extinction	Dr. Felix Bast
MODULE 21	Strategies for Biodiversity Conservation	Prof. Daizy R. Batish
MODULE 22	Wild Life conservation projects in India	Dr. Sunil Mittal
MODULE 25	Keystone Species	Prof. Daizy R. Batish
MODULE 26	Endemic Species of India	Prof. Daizy R. Batish
MODULE 27	Endangered Species of India	Prof. Daizy R. Batish
MODULE 28	International Union for conservation of Nature (IUCN) categories of threatened species	Prof. Daizy R. Batish
MODULE 29	Biotechnological approaches to biodiversity conservation	Prof. Daizy R. Batish
MODULE 30	Wasteland	Dr. Sunil Mittal
MODULE 31	Desertification	Dr. Sunil Mittal
MODULE 32	Wet Lands-I	Dr. Sunil Mittal
MODULE 33	Wet Lands-II	Dr. Sunil Mittal

MODULE 35	Agroforestry	Dr. Sunil Mittal
MODULE 36	Bioprospecting	Dr. Felix Bast
MODULE 37	Bioindicators	Dr. Sunil Mittal and Dr. Hardeep Kaur
MODULE 38	Biopiracy	Dr. Felix Bast
MODULE 39	Red data book; list of threatened flora and fauna	Prof. Daizy R. Batish
MODULE 40	Man and Wildlife Conflicts	Prof. Daizy R. Batish

Paper 4
Environmental Geology

**Paper Coordinator : Prof. R. Baskar, , Guru Jambheshwar
University of Science and Technology, Hisar**

Module No.	Module Title	Content writer
MODULE 01	Geological Time scale and Geological Processes	Dr. Gurmeet Kaur and Dr. Shashi Kad
MODULE 02	Plate Tectonics	Dr. Meenal Mishra
MODULE 03	Rocks-Types, Rock cycle	Dr. Meenal Mishra
MODULE 04	EARTHQUAKES	Dr. Sushmitha Baskar
MODULE 05	Volcanoes	Dr. Sushmitha Baskar
MODULE 07	Glaciers	Dr. Anita Singh, Dr. Somvir Bajar
MODULE 08	WIND AND ITS GEOLOGICAL IMPACTS	Dr. Meenal Mishra
MODULE 09	Deserts and Desertification	Dr. Sushmitha Baskar
MODULE 10	Hydrogeology and Hydrologic cycle	Dr. Asha Manjari
MODULE 11	Streams and Flooding	Dr. Renu Lata
MODULE 14	COASTAL ZONE AND COASTAL PROCESSES	Dr. Benidhar Deshmukh
MODULE 15	Soil as a Resource	Dr. B.Rupini,
MODULE 16	Mineralogy-Minerals, types	Dr. Rachna Bhatia
MODULE 17	ORE GEOLOGY	Prof. Pankaj K Srivastava
MODULE 20	Energy Sources-Fossil Fuels	Dr. Balen Bhagbaty
MODULE 22	Fuel Geology	Dr. Pankaj Mehta
MODULE 25	Palaeontology	Prof. Rajeev Patnaik
MODULE 26	Sedimentology	Prof. A.R. Chaudhri
MODULE 27	Structural Geology	Dr. Meenal Mishra
MODULE 31	Oceanography	Dr. Onkar S. Chauhan
MODULE 32	Natural Resources	Prof. Trilochan Singh
MODULE 33	Isotope Geology	M.E.A. Mondal
MODULE 37	Palaeobotany	Prof. N.N. Dogra and Dr. O.P. Thakur
MODULE 38	NATURAL HAZARDS AND DISASTERS	Dr. Sushmitha Baskar

Paper 5
Water resources and Management
**Paper Coordinator : Dr Hardeep Rai Sharma, IES Kurukshetra
 University, Kurukshetra**

Module No.	Module Title	Content writer
MODULE 01	Water-General Introduction	Dr. Hardeep Rai Sharma
MODULE 02	Water Resources of India	Dr. Hardeep Rai Sharma
MODULE 03	Hydrologic Cycle and Water Budget	Dr. Bhupinder Singh
MODULE 04	Water Measurement Techniques-I	Er. Ranjana Ray Chaudhuri
MODULE 05	Water Measurement Techniques-II	Er. Ranjana Ray Chaudhuri
MODULE 06	Processing of Hydrometer Data	Dr. Deeksha Katyal
MODULE 07	Statistical Analysis of Hydrologic data, Hydrology Frequency Analysis	Er. Ranjana Ray Chaudhuri
MODULE 08	Catchment Modeling-I	Er. Ranjana Ray Chaudhuri
MODULE 09	Catchment Modeling-II	Er. Ranjana Ray Chaudhuri
MODULE 10	Catchment Modeling-III	Er. Ranjana Ray Chaudhuri
MODULE 11	Water Balance	Prof. Suresh Jain
MODULE 12	Water Demand	Dr. Meenakshi Suhag
MODULE 13	River Water Yield Estimation	Er. Ranjana Ray Chaudhuri
MODULE 14	Groundwater Hydrology-I	Dr. Anita Singh
MODULE 15	Groundwater Hydrology-II	Dr. Brijesh Kumar Yadav
MODULE 16	Groundwater Hydrology-III	Dr. Brijesh Kumar Yadav
MODULE 17	Groundwater Hydrology IV (Coupled Flow and Transport)	Dr. Prabhas K Yadav
MODULE 18	Groundwater Hydrology V (Advection, Dispersion, Diffusion and Sorption)	Dr. Prabhas K Yadav
MODULE 19	Water Resources -Planning and Development-I	Dr. Amarjit Singh
MODULE 20	Water Resources -Planning and Development-II	Dr. Amarjit Singh
MODULE 21	Hydropower Generation-I	Prof. Rajesh Kumar Lohchab
MODULE 22	Hydropower Generation-II	Dr. Somvir Bajar
MODULE 23	Reservoir sizing	Dr. Deeksha Katyal
MODULE 24	Reservoir Regulation	Dr. Deeksha Katyal
MODULE 25	Water Quality and its Management	Dr. Bhawna Dahiya
MODULE 26	Physical, Chemical and Biological Characteristics of Water	Dr. Pooja Arora
MODULE 27	Water Pollution-I (Surface and Groundwater Pollution)	Dr. Hardeep Rai Sharma, Sandeep Kumar

MODULE 28	Water Pollution-II (Marine Pollution)	Ms. Anjali Malan and Dr. Hardeep Rai Sharma
MODULE 29	Water Pollution-III (Thermal Pollution)	Dr. Hardeep Rai Sharma and Ms. Anjali Malan
MODULE 30	Drinking water standards	Dr. Dipti Grover
MODULE 31	Water related Hazards	Dr. Somvir Bajar, Dr. Hardeep Rai Sharma
MODULE 32	Water Conservation and Management Strategies	Dr. Rajesh Singh
MODULE 33	Rain water harvesting	Dr. Rashmi Paliwal
MODULE 34	Wetlands Conservation	Dr. Shiv Pratap Raghuvanshi
MODULE 35	Integrated Water Resources Management-I	Dr. Sharda R. Gupta
MODULE 36	Integrated Water Resources Management-II (Implementation and CapacityDevelopment)	Dr. Sharda R. Gupta
MODULE 37	Socio-economic aspects of Water	Dr. Meenakshi Suhag
MODULE 39	Water Governance	Dr. Nisha Rani and Prof. Anand Sagar
MODULE 40	Challenges in Water Management	Dr. Nisha Rani

Paper 6
Remote sensing & GIS application in Environmental Science
Paper Coordinator : Dr. Puneeta Pandey

Module No.	Module Title	Content writer
MODULE 01	Concept of space and time; Types of Satellites	Dr. Puneeta Pandey
MODULE 02	Global Positioning System (GPS)	Dr. Puneeta Pandey
MODULE 03	Space Agencies in the World	Dr. Puneeta Pandey
MODULE 04	Space Agencies in India	Dr. Puneeta Pandey
MODULE 05	Google Earth; Bhuvan	Dr. Puneeta Pandey
MODULE 06	Fundamentals of Remote Sensing	Dr. Puneeta Pandey
MODULE 07	Electromagnetic Radiations	Dr. Puneeta Pandey
MODULE 08	Active and Passive Remote Sensing	Dr. Sandeep Gupta
MODULE 09	Spectral Reflectance	Dr. Puneeta Pandey
MODULE 10	Sensors	Dr. Puneeta Pandey
MODULE 11	Types of Orbits	Dr. Puneeta Pandey
MODULE 12	Types of Platforms in Remote Sensing	Dr. Puneeta Pandey
MODULE 13	Aerial Photography	Dr. Puneeta Pandey
MODULE 14	Data Collection and Scanning systems	Dr. Puneeta Pandey
MODULE 15	Visual Image Interpretation	Dr. Sandeep Gupta
MODULE 16	Digital Image Processing	Dr. Sandeep Gupta
MODULE 17	Elements of GIS	Dr. Puneeta Pandey
MODULE 18	History of Geographic Information System	Dr. Puneeta Pandey
MODULE 19	Map Projections	Dr. L.T. Sasang Guite
MODULE 20	Data Structure in GIS –Raster and Vector Data	Dr. L.T. Sasang Guite
MODULE 21	GIS Softwares	Dr. Puneeta Pandey
MODULE 22	Hierarchical, network and relational data	Dr. Dinesh Kumar
MODULE 23	Geo-relational and object oriented data structure	Dr. Dinesh Kumar
MODULE 24	Vector and Raster based Analysis	Dr. Puneeta Pandey
MODULE 25	Overlays Operation	Dr. Puneeta Pandey
MODULE 26	Map Algebra	Dr. Dinesh Kumar
MODULE 27	Spatial Analysis -Network Analysis	Dr. Dinesh Kumar
MODULE 28	Application of Geospatial Technology in Biodiversity Studies	Dr. Puneeta Pandey
MODULE 29	Applications of Remote Sensing and GIS in Land Resource Management	Dr. Bal Krishan Choudhary
MODULE 30	Application of Geospatial Technology in Air Pollution Management	Dr. Puneeta Pandey
MODULE 31	Applications of Remote Sensing and GIS in Groundwater and Water Pollution	Dr. Jitendra Kumar Pattanaik
MODULE 32	Application of Remote Sensing and GIS for Coastal Zone Management	Dr. Puneeta Pandey
MODULE 33	Applications of Remote Sensing and GIS in Mineral Resources	Dr. Jitendra Kumar Pattanaik
MODULE 34	Application of Geospatial Technology in Disaster Management	Dr. Puneeta Pandey
MODULE 35	Application of Remote Sensing for Vegetation Mapping	Dr. Dinesh Kumar

MODULE 36	Applications of Remote Sensing and GIS in Wildlife Monitoring	Dr. Puneeta Pandey
MODULE 37	Applications of Remote Sensing and GIS in Wasteland mapping	Dr. Bal Krishan Choudhary
MODULE 38	Applications of Remote Sensing and GIS in Conservation of Resources	Dr. Bal Krishan Choudhary
MODULE 39	Application of Remote Sensing and GIS in Watershed Management	Dr. L.T. Sasang Guite
MODULE 40	Applications of Remote Sensing and GIS in Wetland Dynamics	Dr. L.T. Sasang Guite

Paper 7
Energy and Environment
Paper Coordinator : Dr. Dhanya MS

Module No.	Module Title	Content writer
Module 01	Sun as source of energy	Dr. Dhanya MS
Module 02	Solar radiation	Dr. Sunayan Saha
Module 03	Fossil fuel classification and composition	Dr. Dhanya MS
Module 04	Physico-chemical Properties of Fuel	Dr. Dhanya MS
Module 05	Calorific value of fue	Prof. A.K Jain
Module 06	Renewable Energy Resources	Dr. Dhanya MS
Module 07	Hydropower as an energy source	Prof. Arun Kumar
Module 08	Principles of generation of tidal energy	Prof. Purnima Jalihal
Module 09	Principles of generation of ocean thermal energy conversion	Prof. Purnima Jalihal
Module 10	Geothermal energy	Mr. Yogendra Singh, Dr. Dhanya MS
Module 11	Principle and Applications of Wind Power generation	Dr. Dhanya MS
Module 12	Components and types of Wind Turbines	Dr. Dhanya MS
Module 13	Principles of Solar Energy Generation	Dr. Nikhil P.G, Dr. Dhanya MS
Module 14	Applications of Solar Energy	Dr. Dhanya MS
Module 15	Solar Collectors	Mr. Yogendra Singh
Module 16	Solar Photovoltaic system	Dr. Nikhil P.G, Dr. Dhanya MS
Module 17	Solar pond	Dr. Dhanya MS
Module 18	Nuclear energy from fission	Dr. Sandeep Kumar, Dr. S. Prasad, Dr. Dhanya MS
Module 19	Nuclear fusion for Energy	Dr. Dhanya MS, Dr. Sandeep Kumar, and Dr. Shiv Prasad
Module 20	Prospects of Nuclear Energy in India	Dr. Dhanya MS, Dr. Sandeep Kumar, and Dr. Shiv Prasad
Module 21	Principles of Energy Conversion using Magnetic fields	D. Leo
Module 22	Biomass as an Energy source	Dr. Dhanya MS, Dr. Shiv Prasad
Module 23	Types of Biofuels, Energy conversion routes from biomass	Dr. Dhanya MS, Dr. Shiv Prasad
Module 24	Thermochemical Conversion Technologies – Gasification	Prof. A.K Jain
Module 25	Pyrolysis technology for Bioenergy production	Dr. Anil Kumar Sharma
Module 26	Biodiesel production from lipids	Dr. Anil Kumar Sharma, Sardar Swaran Singh
Module 27	Anaerobic Digestion & Biogas Production	Dr. Dhanya MS
Module 28	Ethanol as a source of energy	Dr. Sachin Kumar, Sardar Swaran Singh
Module 29	Urban waste to resource recovery and recycling for energy	Dr. Sachin Kumar, Sardar Swaran Singh

Module 30	Hydrogen as a Fuel for Future & Fuel Cell	Dr. Dhanya MS
Module 31	Emission of Carbon Dioxide from Energy consumption in Developed and Developing Countries	Dr. Dhanya MS
Module 32	Environmental Implications of energy use	Dr. Sheetal K. Radhakrishnan
Module 33	Energy Use Pattern in World and India	Dr. Sheetal K. Radhakrishnan
Module 34	Radiative Forcing and Global Warming	Dr. Dhanya MS
Module 35	Impacts of large scale exploitation of solar energy and wind energy	Dr. Sheetal K. Radhakrishnan, Dr. Dhanya MS
Module 36	Impacts of large scale exploitation of hydropower and other renewable energy sources	Dr. Dhanya MS, Dr. Gulshan K. Sharma
Module 37	Energy Efficiency and Energy Audit	Dr. Dhanya MS
Module 38	Energy Conservation-Principles and Approaches	Dr. Dhanya MS
Module 39	Green buildings	Dr. Dhanya MS
Module 40	Energy Policies-International and National norms	Dr. Shiv Prasad, Dr. Dhanya MS

Paper 8
Atmospheric Processes
Paper Coordinator :

Module No.	Module Title	Content writer
Module 01	Introduction to Atmosphere, Space and Universe	Dr. Sunayan Saha
Module 02	Structure of Atmosphere	Dr. Nilimesh Mridha
Module 03	Atmospheric Properties	Dr. Lalu Das
Module 04	Radiation Budget of Earth	Dr Bappa Das, Dr. Saurav Saha,
Module 05	Basic Meteorological Instruments & Observational Techniques	Dr. R P Samui
Module 06	Advanced Meteorological Instruments and Measurements	Dr. Sunayan Saha
Module 07	Lapse Rate and Atmospheric Stability	Dr. D K Khan
Module 08	Atmospheric Boundary Layer	Dr. Anandakumar Karipot
Module 09	Plume Behaviour	Dr. Puneeta Pandey
Module 10	Energy Heat Transfer	Dr. M K Nanda
Module 11	Radiative Forcing	Dr. Pallath Pradeep Kumar
Module 12	Atmospheric Chemistry	Dr. Puneeta Pandey
Module 13	Aerosols	Dr. Thara Prabhakaran & Baban Nangare
Module 14	Clouds-Introduction and Classification	Dr. NVK Chakravarty
Module 15	Cloud Analysis and Forecasting	Dr. Sunayan Saha, Dr. Pragati Pramanik Maity
Module 16	Condensation and Precipitation	Dr. NVK Chakravarty
Module 17	Weather and Climate	Dr. Sivanand Pai
Module 18	The Climate History of Earth	Debasish Chakraborty
Module 19	Winds and Global Circulation of Winds	Dr. M K Nanda
Module 20	Air Masses and Fronts	Dr. M K Nanda
Module 21	Cyclones and Anti-Cyclones	Dr. D K Khan
Module 22	Coupled Ocean-Atmosphere System, El-Nino and Southern Oscillation (ENSO)	Dr. Lalu Das
Module 23	General Weather Systems and Indian Monsoon	Dr. M K Nanda
Module 24	Climatic Classification	Dr. M K Nanda
Module 25	Distribution of Precipitation over India	Dr. Pulak Guhathakurta
Module 26	Atmospheric Turbulence	Dr. Anandakumar Karipot
Module 27	Transport Processes in Atmosphere	Dr. Lalu Das, Bidhan Chandra, Dr. Sachin Ghude
Module 28	Atmosphere, Ocean and Climate Dynamics	Dr. Vinu Valsala
Module 29	Air Quality and Greenhouse Gases	Dr. Dhanya MS
Module 30	Primary and Secondary Air Pollutants	Dr. Amrita Daripa
Module 31	Biogeochemical Cycles	Dr. Yogalakshmi K.N
Module 32	Climatic Models	Dr. Lalu Das
Module 33	Fundamentals of Numerical Modelling	Dr. P N Sen

Module 34	Weather Forecasting	Dr. Somenath Dutta
Module 35	Agrometeorology	Dr. Sunayan Saha, Dr. Pragati Pramanik Maity
Module 36	Hydrometeorology	Dr. P.P.Adhikary & Dr. Jyotiprava Dash
Module 37	Radar and Satellite Meteorology	Prabir Kumar Das
Module 38	Applications of Remote Sensing in Numerical Weather Prediction	Dr. Soma Sen Roy
Module 39	Applications of GIS and GPS	Dr. (Mrs.) Prachi Mishra Sahoo
Module 40	Role of Meteorology in Aviation	Dr. R Suresh

Paper 9
Environmental Pollution - I Air & Noise
Paper Coordinator :

Module No.	Module Title	Content writer
Module 04	Atmospheric aerosol: Size distribution, Lognormal distribution, Surface area, Volume and mass distribution, Dynamics	Prof. J.S. Laura
Module 05	Aerosols system and Nucleation phenomenon	Prof. J.S. Laura
Module 07	Geneva Convention on long range transport of atmospheric pollutants	Prof. J.S. Laura
Module 11	Filter media selection	Dr. Geeta
Module 12	Adsorption and adsorption based sampling	Dr. Geeta
Module 16	Flue Gas Analyzer Principle for Monitoring COX, NOX, SOX, hydrocarbons	Dr. Geeta
Module 24	Adsorbents, PSA, adsorption cycle, rotary bed/fluidized bed	Dr. Geeta
Module 40	Legal provisions and Act for Noise Pollution	Prof. J.S. Laura

Paper 10
Environmental Pollution -I Water & Soil
Paper Coordinator :

Module No.	Module Title	Content writer
Module 01	Water Sources-Classification, Water quality standard	Prof. J.S. Laura
Module 03	Water pollution	Prof. J.S. Laura
Module 04	Sampling of water and waste water	Prof. J.S. Laura
Module 05	Waste water characteristics, disposal and discharge standards	Prof. J.S. Laura
Module 06	Waste water characteristics of dairy and sugar industry	Prof. J.S. Laura
Module 07	Waste water characteristics of municipal wastewater and textile industry	Prof. J.S. Laura
Module 08	Waste water characteristics of electroplating and tannery industries	Prof. J.S. Laura
Module 09	Waste water characteristics of pulp and paper industry	Prof. J.S. Laura
Module 10	Water and Sewage treatment Plant	Dr. Babita Khosla
Module 11	Coagulation, Flocculation and Precipitation	Dr. Babita Khosla
Module 12	Ion exchange and Filtration	Dr. Babita Khosla
Module 13	Disinfections-Types of disinfectants & mode of action	Dr. Babita Khosla
Module 14	Disinfection by UV, Ozone and Chlorination	Dr. Babita Khosla
Module 15	Water Softening	Dr. Babita Khosla
Module 16	Types of Reactors	Dr. Babita Khosla
Module 17	Secondary Treatment	Dr. Babita Khosla
Module 18	Activated sludge process modifications	Dr. Meenakshi Nandal
Module 19	Anaerobic digesters and Upflow Anaerobic Sludge Blanket (UASB) Reactor	Dr. Meenakshi Nandal
Module 20	Sludge Treatment And Disposal	Dr. Meenakshi Nandal
Module 21	Biological Nitrification and De-nitrification	Dr. Meenakshi Nandal
Module 22	Phosphorus Removal	Dr. Babita Khosla
Module 23	Soil	Dr. Meenakshi Nandal
Module 24	Soil Formation	Dr. Meenakshi Nandal
Module 25	Soil Horizons Development	Dr. Meenakshi Nandal
Module 26	Physical Properties of Soil	Dr. Meenakshi Nandal
Module 27	Chemical properties of soil	Dr. Meenakshi Nandal
Module 28	Biological Properties of Soil	Dr. Meenakshi Nandal
Module 29	Soil Quality Analysis	Dr. Meenakshi Nandal
Module 30	Soil Pollution	Dr. Meenakshi Nandal
Module 31	Control of Soil Pollution	Dr. Meenakshi Nandal
Module 32	Interaction of Pollutants with Soil components-I	Dr. Meenakshi Nandal
Module 33	Interaction of Pollutants with Soil components-II	Dr. Meenakshi Nandal
Module 34	Soil microorganisms and their functions-I	Dr. Babita Khosla
Module 35	Soil Microorganisms and their functions-II	Dr. Babita Khosla
Module 36	Degradation of Insecticides	Dr. Meenakshi Nandal
Module 37	Degradation of Pesticides	Dr. Meenakshi Nandal
Module 38	Degradation of Fungicides	Dr. Meenakshi Nandal

Module 39	Synthetic Fertilizers	Dr. Meenakshi Nandal
Module 40	Synthetic Fertilizers'interaction with soil components	Dr. Meenakshi Nandal

Paper 11
Solid and hazardous waste management
Paper Coordinator :

Module No.	Module Title	Content writer
Module 01	Waste –types and classification	Dr. Yogalakshmi K.N
Module 02	Waste sources and generation rates	Dr.J.Rajesh Banu
Module 03	Traditional methods of waste collection and disposal	Dr. P.Sivashanmugam
Module 04	Factors influencing waste generation, environmental and health hazards	Dr. Yogalakshmi K.N
Module 05	Composition of solid waste	Dr. Logakanthi. S
Module 06	Waste collection -I	Dr. Yogalakshmi K.N
Module 07	Waste collection –Storage containers and collection vehicles	Dr. Yogalakshmi K.N
Module 08	Waste collection –Collection routing and crew	Dr. Yogalakshmi K.N
Module 09	Transfer station	Dr. Yogalakshmi K.N
Module 10	Characterization of waste	Dr. Logakanthi. S
Module 11	Waste Processing –Size Reduction	Dr.J.Rajesh Banu
Module 12	Waste Processing–Volume reduction	Dr.J.Rajesh Banu
Module 13	Source Reduction	Dr. Yogalakshmi K.N
Module 14	Recycling	Dr.J.Rajesh Banu
Module 15	Waste minimization, waste hierarchy, waste audit	Dr. Logakanthi. S
Module 16	Hazardous waste: Definition, sources, classification, collection, segregation, characterization	Dr. Yogalakshmi K.N
Module 17	Hazardous waste: Treatment and disposal	Dr. Yogalakshmi K.N
Module 18	Radioactive wastes: Definition, sources, classification, collection, segregation, Treatment and disposal	Dr. Rajeev Pratap Singh
Module 19	Landfill leachate management	Dr. Yogalakshmi K.N
Module 20	E-Waste: Definition, sources, classification, collection, segregation, treatment and disposal	Dr. Logakanthi. S
Module 21	Sustainable Municipal Solid Waste Management	Dr. Yogalakshmi K.N
Module 22	Biomedical wastes: Definition, sources, classification, collection, segregation, Treatment and disposal	Dr.J.Rajesh Banu
Module 23	Incineration and Combustion	Dr. Yogalakshmi K.N
Module 24	Advanced Thermal Treatment Technologies – Pyrolysis	Dr. Yogalakshmi K.N
Module 25	Stabilization, Solidification, chemical fixation, encapsulation	Dr. AG Murugesan
Module 26	Composting	Dr. Yogalakshmi K.N
Module 27	Vermicomposting	Dr. Yogalakshmi K.N
Module 28	Energy from waste–Biogasification	Dr. Yogalakshmi K.N
Module 29	Anaerobic digestion of solid waste	Dr. Yogalakshmi K.N
Module 30	Advanced Thermal Treatment Technologies – Gasification	Dr. Yogalakshmi K.N
Module 31	Solid waste disposal, open dumping and landfills	Dr. Yogalakshmi K.N

Module 32	Structure and operation of solid waste landfill	Dr. Yogalakshmi K.N
Module 33	Landfill bioreactor	Dr. Yogalakshmi K.N
Module 34	Flyash utilization and rules	Er. Sandeep Jain
Module 35	Landfill Gas Management	Dr. Yogalakshmi K.N
Module 36	Best practices of Solid wastes -Case Studies, National Council's and policy Solidwaste management and Planning	Dr. Rajeev Pratap Singh
Module 37	Municipal waste (management and handling) rules	Dr. Logakanthi. S
Module 38	Hazardous waste (management and handling) rules	Dr. Yogalakshmi K.N
Module 39	Biomedical Waste(management and handling) rules	Dr. AG Murugesan
Module 40	Plastic waste management rules (2016)	Vikram Singh Kahlon

Paper 12

Environmental Management

Paper Coordinator : Dr. Sunil Mittal

Department of Environment Science and Technology,
 Central University of Punjab, Bathinda

Module No.	Module Title	Content writer
Module 01	Prehistoric Man and Environment	Dr. Sunil Mittal, Dr. G.S. Vishakarma
Module 02	Public Awarenessfor Environmental Management-Need, Scope and Importance	Dr. Sunil Mittal and Dr. Hardeep Kaur
Module 03	Current Status of Environment in India(Air and Water)-I	Dr. G.S. Vishakarma
Module 04	Current Status of Environment in India(Waste Management and Energy) -II	Dr. G.S. Vishakarma
Module 05	Current Status of Environment in India(Biodiversity and Climate Change) -III	Dr. G.S. Vishakarma
Module 06	Introduction to Environmental Impact Assessment(EIA)	Dr. Sunil Mittal
Module 07	EIA Notification 1994	Dr. Sunil Mittal
Module 08	Amendments in EIA 1994	Dr. Sunil Mittal
Module 09	EIA Notification 2006 -I	Dr. Sunil Mittal
Module 10	EIA Notification 2006 -II	Dr. Sunil Mittal
Module 11	EIA Notification 2006 -Amendments	Dr. Sunil Mittal
Module 12	Unified EIA Notification 2006 inclusive of Amendments	Dr. Sunil Mittal
Module 13	EIA Methodology	Dr. Sunil Mittal
Module 14	Environment Clearance Process in India	Dr. Sunil Mittal
Module 15	Procedure of Environment clearance of Category B(Building and Construction) and B1 Projects in India	Dr. Sunil Mittal
Module 16	Environmental Clearance for category B2 and mining of minor mineral Projects	Dr. Sunil Mittal
Module 17	Life Cycle Assessment(LCA)	Dr. Yogalakshmi K.N
Module 18	Environmental Management System (ISO 14000)	Dr. Sunil Mittal
Module 19	Environmental Auditing	Dr. Sunil Mittal
Module 20	Environmental labeling and concept of Eco-marks	Dr. Sunil Mittal
Module 21	Role of Judiciary in Environmental Clearance	Dr. Tarun Arora
Module 22	Green Buildings	Dr. Sunil Mittal
Module 23	GRIHA Rating of Green Buildings	Prof. A.K Jain
Module 24	Concept of Smart Cities in India	Dr. G.S. Vishakarma
Module 25	Green Belt Development	Dr. Sunil Mittal
Module 26	Land Use Planning I: Management and National Policies	Dr. Sunil Mittal
Module 27	Land Use Planning II: Policy Framework and Utilization Trends	Dr. Sunil Mittal
Module 28	Ecosystem Degradation and Restoration	Dr. Sunil Mittal
Module 29	Urban and Rural Planning in India	Dr. Sunil Mittal

Module 30	Sustainable Development	Dr. Sunil Mittal and Dr. Hardeep Kaur
Module 31	National Rehabilitation and Resettlement Policy, 2007	Dr. Sunil Mittal and Dr. Hardeep Kaur
Module 32	Hydropower Projects and their Environmental Implications	Dr. Sunil Mittal
Module 33	Judicial Approaches towards EIA	Dr. Tarun Arora
Module 34	EIA Consultation Accreditation Scheme	Dr. Sunil Mittal

Paper 13
Environmental Law and Policies
Paper Coordinator :

Module No.	Module Title	Content writer
Module 01	Environment Pollution : Issues, Challenges and Response at National and International Level	Dr. Manoj Kumar Sharma
Module 02	Constitutional Provisions relating to Environment Protection in India	Dr. Manoj Kumar Sharma
Module 03	Indian Forest Act, 1927	Dr. Shilpa Jain
Module 04	Forest (Conservation) Act, 1980	Dr. Shruti Goyal
Module 05	The Wild Life (Protection) Act, 1972	Dr. Shilpa Jain
Module 06	Scheduled Tribes and Other Traditional Forest Dwellers (Recognition Of Forest Rights) Act, 2006	Dr. Shruti Goyal
Module 07	The Biological Diversity Act, 2002	Dr. Shilpa Jain
Module 08	National Forest Policy, 1988	Dr. Manoj Kumar Sharma
Module 09	Water (Prevention and Control of Pollution) Act, 1974 and its Rules	Dr. Manoj Kumar Sharma
Module 10	Water (Prevention and Control of Pollution) Cess Act, 1977	Dr. Manoj Kumar Sharma
Module 11	Air (Prevention and Control of Pollution) Act 1981 and amendments	Dr. Manoj Kumar Sharma
Module 12	The Environmental (Protection) Act, 1986	Dr. Shilpa Jain
Module 13	Control of Hazardous Waste	Dr. Manoj Kumar Sharma
Module 14	Hazardous and other Wastes (Management and Transboundary Movement) Amendment Rules, 2016	Dr. Shruti Goyal
Module 15	Solid Waste Management Rules, 2016	Dr. Manoj Kumar Sharma
Module 16	Plastic Waste Management Rules, 2016	Dr. Manoj Kumar Sharma
Module 17	E-Waste Management Rules, 2016	Dr. Manoj Kumar Sharma
Module 18	The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-organisms, Genetically engineered organisms or cells, 1989	Dr. Shruti Goyal
Module 19	Biomedical Waste Management Rules, 2016	Dr. Geetika Walia
Module 20	National Environment Policy 2006	Dr. Sangeeta Taak
Module 21	Legal Initiatives to Protect and Regulate Ground Water	Dr. Sangeeta Taak
Module 22	National Water Policy-2012	Dr. Shruti Goyal
Module 23	Coastal Zone Regulation Notification 2011	Dr. Gurneet Singh Dhaliwal
Module 25	Environment Clearance-EIA Notification 2006	Dr. Renuka Soni
Module 26	National Green Tribunal	Dr. Shilpa Jain
Module 27	Stockholm Declaration on Human Environment, 1972	Dr. Shilpa Jain

Module 28	Earth Summit –Rio Conference, 1992	Dr. Shilpa Jain
Module 29	Agenda 21 and Rio +20	Dr. Shilpa Jain
Module 30	Wetland Protection	Dr. Renuka Soni
Module 31	Convention on Wetland of International Importance (Ramsar Convention), 1972	Dr. Sangeeta Taak
Module 32	Climate Change	Dr. Manoj Kumar Sharma
Module 33	UNFCCC, Kyoto Protocol and Paris Agreement	Dr. Manoj Kumar Sharma
Module 34	Convention on Biological Diversity	Dr. Shilpa Jain
Module 35	Cartagena and Nagoya Protocol	Dr. Manoj Kumar Sharma
Module 36	Conservation of Biodiversity	Dr. Geetika Walia
Module 37	Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Their Disposal	Dr. Shilpa Jain
Module 38	Institutional Mechanism : UNEP, GEF etc.	Dr. Manoj Kumar Sharma
Module 39	Montreal Protocol, 1987	Dr. Manoj Kumar Sharma
Module 40	Environment and Public Interest Litigation	Dr. Shruti Goyal

Paper 14
Statistical Applications in Environmental Sciences
Paper Coordinator :

Module No.	Module Title	Content writer
Module 01	Introduction to Statistics and its Importance	Dr. Harmanpreet Singh Kapoor
Module 02	Data and its Types	Dr. Harmanpreet Singh Kapoor
Module 03	Measurement Scales	Dr. Harmanpreet Singh Kapoor
Module 04	Diagrammatic and Graphical Representation of Data I	Dr. Harmanpreet Singh Kapoor
Module 05	Diagrammatic and Graphical Representation of Data II	Dr. Harmanpreet Singh Kapoor
Module 06	Central Tendency Measures-I	Dr. Harmanpreet Singh Kapoor
Module 07	Central Tendency Measures-II	Dr. Harmanpreet Singh Kapoor
Module 08	Measures of Dispersion I	Dr. Harmanpreet Singh Kapoor
Module 09	Measures of Dispersion II with Skewness and Kurtosis	Dr. Harmanpreet Singh Kapoor
Module 10	Introduction to Probability	Dr. Harmanpreet Singh Kapoor
Module 11	Addition and Multiplication Properties of Probability Theory	Dr. Harmanpreet Singh Kapoor
Module 12	Introduction to Bayes Theorem	Dr. Harmanpreet Singh Kapoor
Module 13	Introduction to Random Variable and its Properties	Dr. Harmanpreet Singh Kapoor
Module 14	Introduction to Discrete Probability Distributions	Dr. Harmanpreet Singh Kapoor
Module 15	Introduction to Continuous Probability Distributions	Dr. Harmanpreet Singh Kapoor
Module 16	Concepts of Population, Sample and Confidence Interval	Dr. Felix Bast
Module 17	Statistical Hypothesis Testing and P Values	Dr. Felix Bast
Module 18	t-Distribution and tests of significance based on t-distribution	Dr. Felix Bast
Module 19	F-distribution and tests of significance based on F distribution	Dr. Felix Bast
Module 20	Chi Square (χ^2) Distribution and tests of significance based on χ^2	Dr. Felix Bast
Module 21	Introduction to Matrices and Matrix Algebra	Dr. Sachin Kumar
Module 22	Determinants and its Properties	Dr. Sachin Kumar
Module 23	Applications of Determinants	Dr. Sachin Kumar
Module 24	Inverse of a Matrix and its Application in Solving System of Linear Equations	Dr. Sachin Kumar
Module 31	Basic Principles of Experimental Design	Dr. Harmanpreet Singh Kapoor
Module 32	Completely Randomized Design-I	Dr. Harmanpreet Singh Kapoor

Module 33	Completely Randomized Design-II	Dr. Harmanpreet Singh Kapoor
Module 34	Randomized Block Design and Latin Square Design	Dr. Harmanpreet Singh Kapoor
Module 35	Introduction to Time Series Analysis and its Importance	Dr. Harmanpreet Singh Kapoor
Module 36	Measurement of Secular Trend	Dr. Harmanpreet Singh Kapoor
Module 37	Measurement of Seasonal,Cyclic and Irregular Variation	Dr. Harmanpreet Singh Kapoor
Module 38	Introduction to Stationary Time Series	Dr. Harmanpreet Singh Kapoor
Module 39	Introduction to Non-Stationary Time Series	Dr. Harmanpreet Singh Kapoor
Module 40	Box-Jenkins Methodology	Dr. Harmanpreet Singh Kapoor

Paper 15
Environmental Microbiology & Biotechnology
Paper Coordinator :

Module No.	Module Title	Content writer
Module 01	Pesticide Pollution	Dr. Anju
Module 02	Carbon Monoxide Toxicity	Dr. Anju
Module 03	Lead (Pb) Toxicity	Dr. Anju
Module 04	Biotransformation	Dr. Yogalakshmi K. N, Dr. K N Sangeetha
Module 05	Biotransformation by enzymes	Dr. Yogalakshmi K. N, Dr. K N Sangeetha
Module 06	Microbial Biotransformation	Dr. Yogalakshmi K. N, Dr. K N Sangeetha
Module 07	Major Water Borne Diseases Part I	Dr. Sunil Mittal
Module 08	Major Water Borne Diseases Part II	Dr. Sunil Mittal
Module 09	Major Water Borne Diseases Part III	Dr. Sunil Mittal
Module 10	Airborne Microbial Diseases	Dr. G.S. Vishakarma, Dr. Sunil Mittal
Module 11	Environmental Biotechnology	Dr. Sunil Mittal
Module 12	Role of microorganisms- bioremediation I	Dr. Yogalakshmi K.N
Module 13	Role of microbes and plants in remediation - Phytoremediation	Dr. Yogalakshmi K.N
Module 14	Role of microbes and plants in remediation - Rhizoremediation	Dr. Yogalakshmi K.N
Module 15	Role of microorganisms- bioremediation II	Dr. Yogalakshmi K.N
Module 16	Genetically Modified Crops	Dr. Sunil Mittal
Module 17	Genetically Modified Crops	Dr. Sunil Mittal and Dr. Hardeep Kaur
Module 18	Bio-pesticides	Dr. Sunil Mittal, Dr. G.S. Vishakarma
Module 19	Bio-pesticides -2	Dr. Sunil Mittal, Dr. G.S. Vishakarma
Module 20	Biological Warfare	Dr. Sunil Mittal
Module 21	Fermentation Technology	Dr. Hardeep Kaur
Module 24	Biosensors: An Introduction	Dr. Hardeep Kaur and Dr. Sunil Mittal
Module 25	Nanotechnology and Biosensors	Dr. Hardeep Kaur and Dr. Sunil Mittal
Module 26	Application of Biosensors in Environmental Monitoring and Recent Advances	Dr. Hardeep Kaur and Dr. Sunil Mittal
Module 27	Role of microbes in agriculture as Bio-fertilizers	Dr. Anita Singh
Module 28	Biodiesel from Plant Vegetable Oils and its application as Engine fuel	Prof. A.K Jain
Module 30	Biogas Production from Biomass and Its Applications	Prof. A.K Jain & Dr. Dhanya MS
Module 31	Types of Bioreactor	Dr. Kashyap Kumar Dubey
Module 32	Xenobiotics	Dr. Rajiv Pratap Singh

Module 33	Allelopathy	Dr Gajendra Singh Vishwakarma/Dr.Sunil Mittal
Module 34	Groundwater Microbiology	Dr. Tejpal Dhewa
Module 35	Microbiology of industrial effluents and their treatment	Dr. Tejpal Dhewa
Module 36	Sewage Microbiology and Treatment	Dr. Tejpal Dhewa
Module 37	Bioremediation: Processes and Techniques	Dr. Kiran Bala
Module 38	Bioremediation of Organic Contaminants	Dr. Abhijeet Joshi
Module 39	Bioremediation of Pesticides	Dr. Abhijeet Joshi
Module 40	Bioremediation of Heavy Metals	Dr. Kiran Bala

Paper 16
Environmental Chemistry
Paper Coordinator :

Module No.	Module Title	Content writer
Module 01	Environmental Concentration Units	Prof. K.S. Gupta
Module 02	Environmental Chemical Thermodynamics	Prof. K.S. Gupta
Module 03	Environmental Chemical Kinetics	Prof. K.S. Gupta
Module 04	Environmental Chemical and Physical Equilibria	Prof. K.S. Gupta
Module 05	Environmental Aqueous Solutions of Gases, Acids and Bases, and pH	Prof. K.S. Gupta
Module 06	Basic Inorganic Chemistry for Environmental Sciences	Dr. Y. P. Singh
Module 07	Introductory Organic Chemistry	Prof. K. Maharaj Kumari
Module 08	Atmosphere and Its Properties	Prof. K.S. Gupta
Module 09	Air Pollution	Prof. K.S. Gupta
Module 10	Acid Rain	Prof. K.S. Gupta
Module 11	Atmospheric Oxidation of Acid Rain Precursors	Prof. K.S. Gupta
Module 12	Photochemical Smog and Classical Smog	Prof. K.S. Gupta
Module 13	Chemistry of Stratospheric Ozone Depletion	Prof. K.S. Gupta
Module 14	Green House Effect and Global Climate Change	Prof. K.S. Gupta
Module 15	Tropospheric Photochemistry-Formation of Reactive Radicals and Molecules	Prof. K.S. Gupta
Module 16	Carbon Dioxide and Carbonate System	Prof. K.S. Gupta
Module 17	Biogeochemical Cycles	Dr. Vijay Shridhar
Module 18	Volatile Organic Compounds	Prof. Ashu Rani
Module 19	Chemical Speciation: Environmental Consequences	Dr. Y. P. Singh
Module 20	Particles in the Atmosphere -Aerosols	Dr. Vijay Shridhar
Module 21	Properties of Aerosols	Dr. Vijay Shridhar
Module 22	Indoor Air Pollution	Dr. Vijay Shridhar
Module 23	Aquatic Redox Chemistry	Dr. Alka Sharma
Module 24	Soil-I(Formation, Structure and Chemical Composition)	Prof. Ajay Taneja
Module 25	Soil-II (Essential, Macro and Micro Elements and Ion Exchange)	Prof. Ajay Taneja
Module 26	Properties of Water	Dr. C. P. Singh Chandel
Module 27	Water Pollution	Dr. C. P. Singh Chandel
Module 28	Wastewater Treatment	Dr. C. P. Singh Chandel

Module 29	Sampling of Aerosol, Air and Water	Prof. K. Maharaj Kumari, Dr. Anita Lakhani
Module 30	Sepctrophotometry	Dr. Swagat K. Mohapatra
Module 31	Atomic Spectroscopy, X-ray & Electrophoresis	Dr. Swagat K. Mohapatra
Module 32	Chromatography	Dr. Swagat K. Mohapatra
Module 33	Persistent Organic Pollutants	Dr. Anita Lakhani
Module 34	Carcinogens in Air	Dr. Anita Lakhani
Module 35	Pesticides	Prof. K. Maharaj Kumari
Module 36	Environmental Nuclear Chemistry	Dr. Y. P. Singh