

SCHOOL OF ENVIRONMENTAL SCIENCE

Dr. S.P.M. UNIVERSITY

RANCHI



Syllabus for

M. Sc.

ENVIRONMENTAL SCIENCE

**BASED ON CBCS PATTERN
(Effective From Session 2018-20)**

**To be effective from session 2022-2024
After moderation**

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[Signatures]
Sandeep
Amrita Jai
Anshu
Dhruv
Shobh
Soni

**Distribution of Credits, Marks & Pass Marks: 1 Credit in Theory Paper = 5 Classes of 1 Hr. and
2 Credits in Practical = 2 Classes of 2 Hr. per Semester in a Week; 1 Sem Run for 15 Weeks.**

COURSE STRUCTURE OF M.Sc. ENVIRONMENTAL SCIENCE UNDER CBCS PATTERN

M.Sc. SEMESTER -I								
SUBJECT CODE	TOPICS	TEACHING SCHEME		CREDITS	EXAMINATION SCHEME			Full marks
		THEORY	PRACTICAL		Hours/ Week	Internal (SIA) 1 hr	External (ESUE) 2.5hrs.	
FCM-101T	FUNDAMENTALS OF ENVIRONMENTAL SCIENCE, ENERGY FLOW, FACTORS.	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-101T	THE FRESH WATER HABITAT, THE MARINE HABITAT	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-102T	PRODUCTIVITY, SYSTEM CONCEPT, COMMUNITIES AND BIOMES	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance))	70	100
CCM-101P	PRACTICAL BASED ON THEORY PAPERS FC-1,CC-1 &CC-2.		√	5	10		80 P+20 Viva	100
M.Sc. SEMESTER-II								
ECM-201T	WATER POLLUTION & AIR POLLUTION,GLOBAL & LOCAL ENVIRONMENTAL ISSUES	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-201T	POPULATION, ENVIRONMENTAL CHEMISTRY AND PHYSICS	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-202T	SOIL ENVIRONMENT & POLLUTION, ENVIRONMENTAL MICROBIOLOGY TOOLS &TECHNIQUES	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-201P	PRACTICAL BASED ON THEORY PAPERS EC-1,CC-4 & CC-5		√	5	10		80 P+20 Viva	100
COURSE STRUCTURE OF M.Sc. ENVIRONMENTAL SCIENCE UNDER CBCS PATTERN								
SEMESTER -III								
SUBJECT CODE	TOPICS	TEACHING SCHEME		CREDITS	EXAMINATION SCHEME			Full marks
		THEORY	PRACTICAL		Hours/ Week	Internal (SIA) 1 hr	External (ESUE) 2.5hrs.	
ECM-301T	WATER MANAGEMENT OR ENVIRONMENTAL MANAGEMENT	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-301T	REMOTE SENSING, GIS, NOISE & RADIATION POLLUTION AND ENVIRONMENTAL BIOTECHNOLOGY	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-302T	TOXICOLOGY AND DISASTER MANAGEMENT	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-301P	PRACTICAL BASED ON THEORY PAPERS EC-2, CC-7 & CC-8		√	5	10		80 P+20 Viva	100
M.Sc. SEMESTER-IV								
ECM-401T	WATER MANAGEMENT OR ENVIRONMENTAL MANAGEMENT	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-401T	EIA, CONSERVATION, ENVIRONMENTAL POLICY & LAW	√		5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-401P	PRACTICAL BASED ON THEORY PAPERS EC-2 & EC-3		√	5	5(L) + 1 (P)	20 (Exam)+ 5 (Assign) + 5 (Performance)	70	100
CCM-401D	Dessertation		√	5	10		80 P+20 Viva	100
Total For Semester IV only		Two	One+One	25	28	60	340	400
Total For Semester I, II, & III each		Three	one	20	28	90	310	400


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M.Sc. Environmental Science

SEMESTER I

CCM -101T THE FRESH WATER HABITAT, THE MARINE HABITAT

Full Marks: 70+30 (100)

Exam Duration: 2.5 Hours

Total Lectures: (75+30) = 105

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

UNIT I THE FRESH WATER HABITAT

- Lotic and lentic environments.
- Environmental condition of freshwaters, temperature cycles of lakes.
- Origin and classification of lakes. Classification of lakes on the basis of geography, circulation pattern, and stratification.
- Fertility of lakes.
- Habitat characteristics of lakes and zonation.
- Biological characteristics of lakes: neuston, plankton, nekton and benthos. Annual quantitative history of planktonic organisms; organisms inhabiting the weed beds.
- Food chain and energy flow.

UNIT II THE MARINE HABITAT

- Structure of the ocean floor, zonation of the sea.
- Physical characteristics of the ocean environment.
- Chemical characteristics of the marine environment.
- Biological characteristics of the sea.
- Zonation of organisms in sandy and rocky shores.
- Deep sea adaptations.
- Food chain and energy flow in the marine environment.
- Brief idea of estuaries

Internal assessment: 30

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Anusha
Sandeep
Amrita dal

REFERENCE BOOKS FOR CCM - 101T:

1. **FUNDAMENTALS OF ENVIRONMENTAL STUDIES by MAHUA BASU - Cambridge Press**
2. **ENVIRONMENTAL SCIENCE by Y.K. SINGH - New Age Publication**
3. **ECOLOGY AND ENVIRONMENT by P.D. SHARMA - Rastogi Publication**
4. **FUNDATMENTALS OF ECOLOGY AND ENVIRONMENT by PRANAV KUMAR - Pathfinder**
5. **PRINCIPLE OF ENVIRONMENTAL SCIENCE by CONIGHUM - TATA McGraw Hills**
6. **FUNDAMENTAL OF ECOLOGY by E. ODUM, RINEHART AND WINSTON - New York Publication**
7. **FUNDAMENTAL OF ENVIRONMENTAL BIOLOGY by B. MUKHERJEE - Silverline Publication**

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M.Sc. Environmental Science

SEMESTER I

CCM-102T: PRODUCTIVITY, SYSTEM CONCEPT, COMMUNITIES AND BIOMES.

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) = 105

UNIT I CONCEPTS PERTAINING TO PRODUCTIVITY

- Productivity in ecosystems; concept of gross production, net production, net ecosystem production; primary production, factors affecting primary production.
- Global primary productivity and its estimation.
- Secondary production, factors affecting secondary production; efficiency of production at various levels.
- Succession and changes in productivity.
- Measurement of primary and secondary productivity.
- Man's use of productivity and the global scenario with respect to food production and population increase.

UNIT-II: SYSTEM CONCEPT AND DYNAMICS

- System concept, system analysis, system measurement, data analysis.
- System modeling: analytical models, stochastic models.
- Data processing, Computer programming (basics), data structure and organization, building models, use of microcosms and mesocosms in model building.
- Development of a model

UNIT- III: COMMUNITIES AND THEIR DEVELOPMENT

- The community concepts.
- Development of the community through succession.
- Community organization and stratification.
- Classification of the community on the basis of life forms.
- The continuum concept and ordination. Ecotone and ecotype.
- Concept of species diversity, various diversity indices, changes in diversity with community development, impact of man on global diversity.
- The niche concept: fundamental and realized niche, niche competition, niche width, niche overlap, changes in niche dimensions with stress, characteristics of the niche, niche adjustments. Community periodism as a niche dimension: circadian, circannual and lunar rhythms, hormonal control.
- Impact of the community on the environment.

UNIT-IV: BIOMES AND BIOGEOGRAPHY

- Concept of biogeography, components of species diversity, species richness, and relative abundance.
- Continental drift, dispersal dynamics, land bridges, endemism, bio-realms.
- Island biogeography.
- Biomes, their distribution, principal biomes of the world.
- Detailed study of the paleoecology and biome types: tropical, temperate, grassland, desert, alpine tundra biomes with reference to India.

Internal assessment: 30

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Shoh
Anshu
Sandeep
Amrita
Jain

REFERENCE BOOKS FOR CCM-102T

1. FUNDAMENTALS OF ENVIRONMENTAL STUDIES by MAHUA BASU – Cambridge University Press.
2. ENVIRONMENTAL SCIENCE by Y.K. SINGH - New Age Int. Publishers
3. ENVIRONMENTAL CHEMISTRY BY ANIL K. DE - New Age Int. Publishers
4. THE ATMOSPHERE AN INTRODUCTION TO METEOROLOGY BY FREDRICK K LUTGENS, EDWARD JTA RUBCK & DENNIS TASA - Pearson
5. A TEXT BOOK OF ENVIRONMENTAL CHEMISTRY AND POLLUTION CONTROL BY DR. SS DARA & DR. D.D. MISHRA - S. Chand
6. CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE BY SAWYER MC CARTY PARKN - McGraw Hill
7. ENVIRONMENTAL CHEMISTRY BY MANNAHAN - Lewis Publishers, Chelsea
8. MODERN METHODS OF CHEMICAL ANALYSIS BY ROBERT, SHIELDS, CAIRNS & WILLIAM – John Wiley & Sons.
9. ECOLOGY AND ENVIRONMENT by P.D. SHARMA – Rastogi Publication
10. FUNDATMENTALS OF ECOLOGY AND ENVIRONMENT by PRANAV KUMAR - Pathfinder
11. PRINCIPLE OF ENVIRONMENTAL SCIENCE by CONIGHUM - TATA McGraw Hills
12. FUNDAMENTAL OF ECOLOGY by E. ODUM, RINEHART AND WINSTON – New York Publication


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Anshul
Sandeep
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Jai

SEMESTER I

Total Lectures: $(75+30) = 105$

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Anshul
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America
Shah
Ramesh
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REFERENCE BOOKS FCM-101T:

8. FUNDAMENTALS OF ENVIRONMENTAL STUDIES by MAHUA BASU - Cambridge Press
9. ENVIRONMENTAL SCIENCE by Y.K. SINGH - New Age Publication
10. ECOLOGY AND ENVIRONMENT by P.D. SHARMA - Rastogi Publication
11. FUNDATMENTALS OF ECOLOGY AND ENVIRONMENT by PRANAV KUMAR - Pathfinder
12. PRINCIPLE OF ENVIRONMENTAL SCIENCE by CONIGHUM - TATA McGraw Hills
13. FUNDAMENTAL OF ECOLOGY by E. ODUM, RINEHART AND WINSTON - New York Publication
14. FUNDAMENTAL OF ENVIRONMENTAL BIOLOGY by B. MUKHERJEE - Silverline Publication

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Shobh
Anshu
Sandeep
Amita dal
Anshu

M.Sc. Environmental Science

SEMESTER I

CCM-(101P+102P) + FCM-101P

PRACTAL

Full Marks: 100

Exam Duration: 3 Hours

Total Lectures: (75+30) =105

1. Measurement of various aquatic parameters (15)

- Determination of dissolved oxygen (Winkler's method) in a water sample.
- Determination of carbon dioxide of a water sample.
- Determination of alkalinity of a water sample.
- Determination of chloride in a water sample.

2. Measurement of nutrients in a water sample (15)

- Determination of nitrate in a water sample.
- Determination of sulphate in a water sample.
- Determination of phosphate in a water sample.

3. Measurement of productivity in a water body. (10)

- Measurement of soil respiration.

4. Community analysis (10)

- Species area curve using the quadrat method.
- Calculation of species diversity in an aquatic community.
- Bray-Curtis dissimilarity index

5. Knowledge of common ecological equipment, Adaptation and animal association studies. $6 \times 5 = (30)$

6. Practical record (10)

7. Viva- voce (10)

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Amit
Sandeep
Anita
Joni

M.Sc. Environmental Science

SEMESTER II

CCM-201T: POPULATION ENVIRONMENTAL CHEMISTRY AND PHYSICS

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) =105

UNIT- I: POPULATION ATTRIBUTES, GROWTH AND INTERACTION

- Describing populations: natality, mortality, fecundity, survivorship curve, age structure.
- Population growth, carrying capacity and environmental resistance, logistic equation, J-shaped, and S-shaped growth curve. Cybernetic model.
- Population regulation: density dependent and density independent factors.
- Intraspecific interaction: Nicholson's model, interspecific interaction: Gause's model.
- Prey-predator interaction: Lotka and Volterra-model.
- Host-parasitoid interaction: Nicholson- Bailey model.
- r and k-selected populations.
- Application of population studies: agriculture, fisheries, forestry.
- The world population scenario and the future impact on global resources.

UNIT-II: FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY

- Basic concepts, valency, atomic weight, molecular weight; concentration of solutions: molarity, normality, equivalent weight, molality, density calculations, expression of analytical results.
- Chemical reactions, equilibrium constant for dissociating species; acid-base equilibrium, pH scale.
- Salts of polyprotic acids, acid-base titrations, detection of end point, indicators, effect of acidity on the solubility of precipitate.
- Oxidation-reduction potential, Nernst equation, the pH electrode; buffers, buffering mechanism, conductivity, Beer's law.

UNIT-III: FUNDAMENTALS OF ENVIRONMENTAL PHYSICS

- Force, weight and friction: gravitational force, centripetal and centrifugal force, velocity, acceleration, momentum, friction, surface tension.
- Work, power and energy.
- Density and pressure: atmospheric pressure, measurement of pressure in pipelines.
- Heat and temperature, laws of thermodynamics, Gibb's free energy, Pressure gradient force, Coriolis force, Wind velocity, Pressure belt.
- Hygrometry: vapor pressure, dew point, absolute and relative humidity, wet and dry bulb hygrometer.
- Gas laws: specific heat, lapse rate (Adiabatic & Environmental Lapse rate), Mixing Ratio, Mixing height, Gaussian Plume Model.
- Electromagnetic radiation and light: definition and units, measurement of irradiance in the aquatic environment. Measurement of turbidity.

Internal assessment: 30

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Anand
Sandeep
Amrita
Anurag
Anshu
Anshu

REFERENCE BOOKS FOR CCM-201T:

13. FUNDAMENTALS OF ENVIRONMENTAL STUDIES by MAHUA BASU – Cambridge University Press.
14. ENVIRONMENTAL SCIENCE by Y.K. SINGH - New Age Int. Publishers
15. ENVIRONMENTAL CHEMISTRY BY ANIL K DE - New Age Int. Publishers
16. THE ATMOSPHERE AN INTRODUCTION TO METEROLOGY BY FREDRICK K LUTGENS, EDWARD JTA RUBCK & DENNIS TASA - Pearson
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21. ECOLOGY AND ENVIRONMENT by P.D. SHARMA – Rastogi Publication
22. FUNDATMENTALS OF ECOLOGY AND ENVIRONMENT by PRANAV KUMAR - Pathfinder
23. PRINCIPLE OF ENVIRONMENTAL SCIENCE by CONIGHUM - TATA McGraw Hills
24. FUNDAMENTAL OF ECOLOGY by E. ODUM, RINEHART AND WINSTON – New York Publication
25. FUNDAMENTAL OF ENVIRONMENTAL BIOLOGY by B. MUKHERJEE, - Silverline Publication, Allahabad
26. FUNDAMENTAL ENVIRONMENTAL ENGINNEERING BY MASTERS & GILBERTS – Wendell P. Ela
27. POPULATION ECOLOGY BY M. & MORTIMER BEGON - Blackwell Scientific Publications, London

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M.Sc. Environmental Science

SEMESTER II

CCM-202T: SOIL ENVIRONMENT, DATA ANALYSIS, ENVIRONMENTAL MICROBIOLOGY

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) = 105

UNIT- I: SOIL ENVIRONMENT

- Soil formation (pedogenesis).
- Soil profile, soil types, soil characteristics (physical, chemical, and biological)
- Soil environment, soil biota.
- Food chain and energy flow in the soil habitat.
- soil microbiology

UNIT- II: SOIL POLLUTION

- Transport and behavior of soil pollutants.
- Sources of soil pollutants: industrial waste, urban waste, hospital wastes, agricultural wastes (fertilizers, pesticides), radioactive wastes.
- Effects of soil pollutants, prevention and control of soil pollution, solid waste management and strategies., assessment of soil pollutions, international standards.
- Biotechnological methods of waste treatment.

UNIT- III: QUANTITATIVE ANALYSIS OF DATA

- Basics of statistical tools: measures of central tendencies: summation, mean, median, mode.
- Measures of dispersion: sum of squared deviations, variance, standard deviation, standard error, confidence in estimating population mean, confidence limits, students t-test
- Hypothesis testing. Test of significance, goodness of fit chi-square test.
- Correlation and regression:
- Percentage and powers, significant figures.
- Logarithms and exponential functions, natural logarithms, semi and double logarithmic plotting.
- Basic Differentiation and integration
- Matrix algebra.

UNIT-IV: TOOLS, TECHNIQUES AND ENVIRONMENTAL MICROBIOLOGY

- Principles and working of: pH meter, conductivity meter, DO meter, Hygrometer, Rain gauge, Turbidimeter, High-Volume Sampler, COD-Digestion
- Spectroscopy: UV-VIS Spectrophotometer, flame photometer, atomic absorption spectrophotometer.
- Ecological groups of microorganisms, microbial interactions (associations) plant-microbe associations, animal-microbe associations, microbe-microbe interactions; water, aero and soil-microbiology.

Internal assessment: 30

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REFERENCE BOOKS FOR CCM-202T:

1. ENVIRONMENTAL MICROBIOLOGY BY P.D SHARMA – Rastogi Publication
2. FUNDAMENTALS OF BIOSTATISTICS BY P HANMANATH RAO & K JANARDAN - Wiley Pub.
3. PRINCIPLES AND PRACTICE OF SOIL SCIENCE. THE SOIL AS A NATURAL RESOURCE, BY ROBERT E WHITE - Wiley
4. BIOSTATISTIC BY VEERBALA RASTOGI – Medtech Publication
5. BIOSTATISTICS BY KHAN AND KHANAM – Ukaaz Publication
6. BIOSTATISTICS BY SADGHURU PRASAD – Rastogi Publication
7. MICROBIAL BIOLOGY BY R.M. ATLAS & BARTHA – Wiley Publication
8. DYNAMICS OF ENVIRONMENTAL BIOPROCESSES BY MODELING AND SIMULATION-SNAPE & DUNE
9. BIOSTATISTICAL ANALYSIS J.H ZAR - Pearson
10. ENVIRONMENTAL BIOLOGY IN REFERENCE TO INDIA BY B. MUKHERJEE- Silverline Publication, Allahabad
11. ECOLOGY OF SOIL ANIMALS By Mc Graw Hill
12. FUNDAMENTALS OF ENVIRONMENTAL BIOLOGY BY B. MUKHERJEE - Silverline Publication, Allahabad

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M.Sc. Environmental Science

SEMESTER II

ECM-201T: WATER AND AIR POLLUTION, GLOBAL AND LOCAL ENVIRONMENTAL ISSUES

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) =105

UNIT- I: WATER POLLUTION

- Pollutants, types, entry of pollutants into the environment and biological systems. Stability, stress and strain. Bioaccumulation and Biomagnification.
- Ecological and biochemical aspects of water pollution: water quality parameters; criteria and standards. General effect of pollutants.
- Types and characteristics of domestic, industrial, agricultural, and sewage wastes – their effects on water bodies: chemical and bacteriological sampling and analysis.
- Waste water treatment, and control of water pollution.

UNIT-II: LOCAL ENVIRONMENTAL ISSUES

- Use of Pesticides and Fertilizers
- biomagnification and problems.
- Wetlands and wastelands and their management.
- Deforestation and movements in India: Chipko, Appiko, Silent valley project, mega dams and environmental issues, pollution and its impact with reference to India.
- Resource use and its impact on biogeochemical cycling;
- Habitat loss, fragmentation, degradation and its impact on biodiversity; salinization.

UNIT III: AIR POLLUTION

- Air pollution: dispersion and fate of atmospheric pollutants, sources: point and non-point sources; primary air pollutants and ambient air quality standards. NAAQS, Air quality Index.
- Sources, effects and control measures of the following air pollutants: suspended particulate matter, carbon monoxide, oxides of nitrogen, oxides of Sulphur, photochemical smog.
- Assessment of air pollution. Indoor air pollution.
- Global air pollution problems: Acid rains, Ozone problem, Global warming.
- Plume Behavior

UNIT-IV: GLOBAL ENVIRONMENTALISSUES

- Global warming and climate change, carbon sinks, forests and climate change, El Nino, La Nina and climate change; coral bleaching. Climate change and its effect on biodiversity; loss of biodiversity and extinction.
- Global energy security; stress on the environment society and resources; human population problem-the number game.
- Nation Action on Climate Change
- Carbon Sequestrations and Carbon Credit
- Genetically engineered food; third world debt and disaster recovery.
- Economics and environment. Climate, justice and equity.

Internal assessment: 30

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REFERENCE BOOKS FOR ECM-201T:

1. ENVIRONMENTAL MANAGEMENT TEXT AND CASES BY BALA KRISHNAMOORTHY – Tech Neo
2. A TEXTBOOK FOR ENVIRONMENTAL CHEMISTRY AND POLLUTION CONTROL BY Dr. S. S. DARAH & Dr. D. D. MISHRA - S. Chand
3. CLIMATOLOGY BY D. S. LAL – Sharda Pustak Bhavan
4. WATER POLLUTION BIOLOGY BY P.D. ABEL, JOHN WILEY AND SONS - New York.
5. FUNDAMENTALS OF ENVIRONMENTAL SCIENCES B. MUKHERJE - Silverline Publication, Allahabad.
6. CLIMATOLOGY BY SAVINDRA SINGH – Pravalika Publication
7. FUNDAMENTAL OF ENVIRONMENTAL ENGINEERING BY MASTERS AND GILBERTS – Wendell P Ela
8. GLOBAL ENVIRONMENTAL CHANGE BY A. N. MANNION - Longman Publication
9. AIR POLLUTION BY M. N. RAO & H. V. N. RAO - McGraw Hill
10. ENVIRONMENTAL POLLUTION CONTROL ENGINEERING BY C. S. RAO - New Age International Publishers
11. WATER POLLUTION BY P. K. GOEL - New Age International Publishers

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Amiti
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Sandeep
Anita del

M.Sc. Environmental Science

SEMESTER II

CCM-(201P+202P) + ECM-201P; PRACTICAL

Full Marks: 100

Exam Duration: 3 Hours

Total Lectures: (75+30) = 105

1. Aquatic

(15)

- Measurement of conductivity of a water sample.
- Measurement of pH by a pH meter of a water or soil sample.
- Measurement of total hardness of a water sample.
- Measurement of silicate using a spectrophotometer.

2. Soil

(15)

- Measurement of water holding capacity of soil.
- Measurement of soil organic matter.
- Determination of available phosphorus.
- Determination of soil nitrate.

3. Plankton

(15)

- Qualitative and quantitative analysis of plankton
- Importance value index

4. Quantitative analysis from datasets

(15)

- Co-relation, Regression simple
- Multiple regression
- Species diversity calculation from plankton data

5. Tools and Techniques

Working principle: Spectrophotometer, pH meter, Conductivity meter, DO meter, COD Digester, Ekman's dredge.

(20)

7. Sessional work

(10)

8. Viva-Voce

(10)

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Aushil
Jai
Amrita
Shah
Sandeep
Sharma

M.Sc. Environmental Science

SEMESTER III

CCM-301T: REMOTE SENSING, GIS, NOISE & RADIATION POLLUTION AND ENVIRONMENTAL BIOTECHNOLOGY

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30)=105

UNIT- I: REMOTE SENSING

Electromagnetic Radiation as Remote Sensing Medium; General Mechanism of Remote Sensing Data Recording; General Characteristics of Remote Sensing Platforms; General Characteristics of Remote Sensing Sensors; Indian Remote Sensing Satellites and Sensors. Spectral Characteristics of Common Natural Objects; Atmospheric Effects on Remote Sensing Data; Spectral Signatures and Spectral Response Patterns; Resolution of Remote Sensing Data Applications of Remote Sensing; Remote Sensing Applications in Environmental Studies; Digital Image enhancement and classification methods; Principles of Microwave Remote Sensing; Characteristics of Microwave remote sensing Data; Radar and Lidar: Applications of Microwave Remote Sensing Data.

UNIT-II: GIS

GIS- Definition and Concepts Geographical Data and GIS; Coordinate Systems and Datums; Digital representation of geographical data-Raster and Vector models; GIS Data Standards-Concepts and Components; Conceptual and Logical Data Modelling; Applications of GIS

UNIT – III: RADIATION POLLUTION AND NOISE POLLUTION

Nature of sound, sound level and decibel scales, noise pollution assessment, control measures and management strategies, indoor noise pollution and control, transport noise and control.

Radioactive emission and ionizing radiations, units of radioactivity and measurement of toxic dose, radioactive processes in use: natural and man-made radiations, effect of radiations on man, ecosystems, and aquatic organisms. Control and management of radiation pollution.

UNIT-IV: ENVIRONMENTAL BIOTECHNOLOGY

Growth and demand for environmental biotechnologies for cleaner processes, bioremediation of soil and water, environmental oil biocatalysts, cleaner technology through microbial processes, novel bioinsecticides, genetically engineered microorganisms in biotechnological processes, bio-probes, Bio-sensor, Bio-fuels.

Internal Assessment- 30 Marks

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Anshu
Amrita del Soli
Shreshth
Suresh
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REFERENCE BOOKS FOR CCM-301T:

1. REMOTE SENSING PRINCIPLES AND APPLICATIONS BY DR. B. C. PANDA - Viva
2. BASICS OF REMOTE SENSING AND GIS BY DR. S. KUMAR - Laxmi Publication
3. ENVIRONMENTAL GEOGRAPHY BY SAVINDRA SINGH - Pravalika Publication
4. A TEXT BOOK OF ENVIRONMENTAL CHEMISTRY AND POLLUTION CONTROL BY DR. S. S. DARA & DR. D. D. MISHRA - S. Chand
5. INTRODUCTION TO ENVIRONMENTAL REMOTE SENSING BY CURTIS - Springer
6. ENVIRONMENTAL BIOTECHNOLOGY BY S. N. JOGDANEL - Himalaya Publishing House
7. ENVIRONMENTAL GEOLOGY BY EDWARD BY A. KELLER - Charles. E Merrill Pub. Co
8. AIR POLLUTION AND CONTROL BY K. V. S. G. MURLIKRISHNAN - Laxmi Publication
9. REMOTE SENSING AND GIS BY V. MADHAVAN RAO - Chapman & Hall
10. ENVIRONMENTAL BIOTECHNOLOGY BY P. K. MOHAPATRA - Wiley
11. ENVIRONMENTAL BIOTECHNOLOGY BY ALLEN K - CBS Publisher

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Aushu
Soni
Sandeep
Anshika

M.Sc. Environmental Science

SEMESTER III

CCM-302T: TOXICOLOGY AND DISASTER MANAGEMENT.

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) = 105

UNIT-I: TOXICOLOGY AND TOXICANTS

- Introduction, classification, framework for environmental toxicology.
- Toxic agents: pesticides, metals, radiations, carcinogens, heavy metals and poisons, mode of action of toxicants, routes of entry, accumulation of toxicants, bioaccumulation, biomagnifications.
- Various types of interactions. Factors affecting toxicity.
- Biotransformation of toxicants, biodegradation

UNIT -II: EFFECTS OF TOXICANTS AND ASSESSMENT

- Effect of toxic substances on organisms, types of effects: physiological, behavioral, mutagenic, teratogenic. Effects at the cellular level.
- Geno toxicology, human toxicology, occupational safety and health administration.
- Toxicological testing methods. Assessment of toxicity: LD₅₀, LT₅₀, LC₅₀.
- Statistical methods, Probit Units, toxic dose, dose- response relationship.
- Biomonitoring, bioindicators (indicator species).
- Environmental and occupational Health.

UNIT-III: NATURAL AND ANTHROPOGENIC HAZARDS

- Definition and types of Natural Disasters and its concepts.
- Natural hazards:

hydrological, atmospheric & geological hazards; earthquake: seismic waves, epicenter; volcanoes: causes of volcanism, geographic distribution; floods: types and nature, frequency of flooding; landslides: causes and types of landslides, landslide analysis; drought: types of droughts - meteorological, agricultural, hydrological, and famine; Glacial Lake Outburst Floods (GLOF); tornadoes, cyclone &

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- Anthropogenic hazards:

UNIT-IV: DISASTER MANAGEMENT

- Internal assessment: 30**

Auschil
 Jari
 Dhan
 Jansheep
 Amerita del
Shah
Shah
Shah

REFERENCE BOOKS FOR CCM-302T:

1. ENVIRONMENTAL TOXICOLOGY BY P. D. SHARMA – Rastogi Publication
2. ENVIRONMENTAL TOXICOLOGY SRUJANA KATHI – Notion Press
3. A TEXT BOOK OF MODERN TOXICOLOGY, ERNEST HODGSON - Wiley
4. TOXICOLOGY BY S. V. S. RANA - Wiley
5. ENVIRONMENTAL BIOLOGY AND TOXICOLOGY BY B. MUKHERJEE – Silverline publication
6. CHEMICAL PRINCIPLES OF ENVIRONMENTAL POLLUTION BY J. AND AYRES - Wiley

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Amit
Saurabh
Anurag
Sham
Saurabh
Sandeep
Amrita

M.Sc. Environmental Science

SEMESTER III

ECM-301T: WATER MANAGEMENT

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) = 105

UNIT- I: BASIC HYDROLOGICAL CONCEPTS:

- The characteristics of water.
- Rivers and lakes- their distribution, origin and forms (with reference to India).
- The hydrological cycle, and global water balance.
- Factors influencing the inland waters (light and heat); Water movements;
- Streams their origin and hydrodynamics.
- Ground water levels and Environmental influences.
- Major physical and chemical factors (light, temperature, gases, nutrients).
- Aquatic biota: phytoplankton, zooplankton, benthos, periphyton, macrophytes, fish and other animals. Primary production in lakes, rivers, estuaries and wetlands.
- Nutrient dynamics in lakes and rivers.
- Impact of man on water resources.
- Paleolimnology: Ontogeny of inland aquatic systems; Natural eutrophication.

UNIT- II ENTRY OF POLLUTANTS AND ITS IMPACT

- Types of pollutants, entry of pollutants into the aquatic environment and biological systems.
- Stability stress and strain, bioaccumulation and biomagnification, models of pollutant movement through the aquatic food chain.
- Water pollution: natural qualities of water, national and international standards; types of pollution: industrial, organic, thermal; effects of pollutants: heavy metals, inorganic reducing agents, heated effluents, organic pollutants.
- Cultural eutrophication and its impact on inland waters.

Internal assessment: 30

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REFERENCE BOOKS FOR ECM-301T:

1. ENVIRONMENTAL MANAGEMENT TEXT AND CASES BY BALA KRISHNAMOORTHY – PHI Publication
2. NATURAL RESOURCES CONSERVATION OLIVER S. OWEN & CHIRAS- Pearson
3. ECOLOGY OF NATURAL RESOURCES BY RAMADE - Wiley
4. WATER POLLUTION BIOLOGY BY P. D. ABE - John Wiley and Sons
5. FUNDAMENTALS OF ENVIRONMENTAL SCIENCES B. MUKHERJEE - Silverline
Publication
6. ECOLOGY OF FRESH WATER BY B. MOSS – Blackwelll Publication
7. INTRODUCTION TO FRESH WATER ALGAE BY A. PENTECOST - Richmond Publication
8. ELEMENTS OF MARINE ECOLOGY BY R. V. TAIT - Butterworth

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Ravi
Shohi
Hem
Anshu
Sandeep
Amrita del
Soni

OR

M.Sc. Environmental Science

SEMESTER III

ECM-301T: ENVIRONMENTAL MANAGEMENT

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours Total Lectures: (75+30) = 105

UNIT-I: STRATEGIES FOR ENVIRONMENTAL MANAGEMENT

- Sustainable development; International cooperation to accelerate sustainable development in developing countries.
- Population dynamics and sustainability.
- Integrating environment and decision making.
- Protecting the environment; integrated approach to the planning and management of land resources; combating deforestation; managing fragile ecosystems; protection of the oceans.
- Management of solid and hazardous wastes.
- Protection of the quality and supply of freshwaters.

UNIT- II: STRENGTHENING THE ROLE OF MAJOR GROUPS AND MEANS OF IMPLEMENTATION

- Global action of women towards sustainable development.
- Financial resources and mechanisms.
- Promoting environmental education and awareness.
- Transfer of environmentally sound technology;
- Environmentally sound management of biotechnology
- Strengthening the role of farmers; promoting sustainable agriculture and rural development.
- Management of biodiversity; global campaigns and people's movement to save the environment.
- Global conferences to combat environmental problems (COP up to latest); environment and health





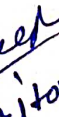
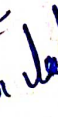



Internal assessment: 30

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Anshu
Sandeep
Anshu dal

REFERENCE BOOKS FOR ECM-301T:

- 1. ENVIRONMENTAL MANAGEMENT TEXT AND CASES BY BALA KRISHNAMOORTHY - PHI Publication**
- 2. NATURAL RESOURCES CONSERVATION OLIVER S. OWEN & CHIRAS - Pearson**
- 3. ECOLOGY OF NATURAL RESOURCES BY RAMADE - Wiley**
- 4. WATER POLLUTION BIOLOGY BY P. D. ABEL - John Wiley and Sons**
- 5. FUNDAMENTALS OF ENVIRONMENTAL SCIENCES B. MUKHERJEE - Silverline Publication**
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- 7. INTRODUCTION TO FRESH WATER ALGAE BY A. PENTECOST - Richmond Publication**
- 8. ELEMENTS OF MARINE ECOLOGY BY R. V. TAIT - Butterworth Publication**

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M.Sc. Environmental Science

SEMESTER III

CCM-(301P+302P) + ECM-301P PRACTICAL

Full Marks: 100

Exam Duration: 3 Hours

Total Lectures: (75+30) = 105

- | | |
|------------------------------------------------------------------------------------------------------------|----|
| 1. Statistical analysis of data on toxicology | 15 |
| 2. Determination of suspended particulate matters in the atmosphere. | 20 |
| 3. Determination of phosphate or chloride in water sample. | 15 |
| 4. Working and principle of: respirable dust sampler, high volume sampler, spectrophotometer, BOD chamber. | 30 |
| 5. Sessional work | 10 |
| 6. Viva-voce | 10 |

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Sandeep
Amrita del

M.Sc. Environmental Science

SEMESTER IV

CCM-401T: EIA, CONSERVATION; ENVIRONMENTAL POLICY, ETHICS AND LAWS.

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) =105

UNIT- I: ENVIRONMENTAL IMPACT ASSESSMENT

- Introduction. The need for EIA, the EIA process, preliminary proposal, initial discussion and public participation, formal proposal.
- Screening, impact identification, scoping, impact forecasting, final report-environmental impact statement, monitoring of environmental impacts, environmental auditing, environmental legislation.

UNIT- II: CONSERVATION OF WATER, SOIL, FORESTS, ENERGY

- Natural resources, types, uncontrolled resource utilization: the cause of concern,
- Areas of concern: deforestation, soil erosion, desertification, pollution and eutrophication, over exploitation of selected species, destruction for commercial purposes, development of a fuel powered urban-industrial society, threat of war, destruction of biodiversity.
- Management strategies and sustainable development.
- Conservation of forests, social forestry; soil conservation; conservation of energy.
- Conservation of biodiversity.

UNIT- III: ENVIRONMENTAL POLICY

- Introduction; the earth summit; environmental change.
- The national environmental policy: forest management policy; policy on the conservation of biodiversity; the water management policy; policy on the prevention of pollution and management; policy on environmental awareness and education; policy on energy.

UNIT- IV: ENVIRONMENTAL ETHICS AND ENVIRONMENTAL LAW

- Environmental ethics, The environment (protection) Act, 1986;
- The Indian Wildlife (Protection) Act, 1972, amended 1993; No. 16 of 2003, [17/1/2003] The Wild Life (Protection) Amendment Act, 2002; S.O.1085(E), [30/9/2002] - The National Wildlife Action Plan. Forest (Conservation) Act, 1980, amended 1988;
- Mines and minerals (development and regulation) act, 1957;S.O.24(E), [6/1/2000] –
- The Hazardous Wastes (Management and Handling) Amendment Rules, 2000; S.O.698(E), [17/6/2003] –
- The Recycled Plastics Manufacture and Usage (Amendment) Rules, 2003; G.S.R.347(E), [1/8/1996] –
- The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996; S.O. 1069(E), (17/9/2003)
- Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003;
- The water (prevention and control of pollution) CESS Act, 1977;The air (prevention and control of pollution) Act, 1981;S.O.123(E), [14/2/2000] -
- Noise Pollution (Regulation and Control) Rules, 2000.
- The Scheme on Labeling of Environment Friendly Products (ECOMARK). S.O. 195(E), [19/01/2009] –
- Environmental Impact Assessment Notification-2009.

Internal assessment 30 Marks

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Sandeep, Anshul, Anurag, Anshu, Anshu

REFERENCE BOOKS FOR CCM-401T:

1. ENVIRONMENTAL IMPACT ASSESSMENT by N. S. RANAH – PHI Publication.
2. ENVIRONMENTAL LAW AND INTRODUCTION by NAWNEET VIBHAW JUSTICE & SWATANTER KUMAR - Lexis Nexis Publication.
3. ENVIRONMENTAL IMPACT ASSESSMENT by N. S. RAMAN, A. R. GAJBHIYE & S. R. KHANDESHWAR - Wiley Publication.
4. NON-CONVENTIONAL ENERGY RESOURCE by D. S. CHAUHAN & S. K. SHRIVASTAVA - New Age International Publishers
5. ENVIRONMENTAL LAW IN INDIA by P LEELA KRISHNAN - Lexis Nexis Publication.
6. ENVIRONMENTAL LAW by DR. S. C. TRIPATHI - Central Law Publication.
7. PRINCIPLES AND PRACTICE OF SOIL SCIENCE. THE SOIL AS A NATURAL RESOURCE by ROBERT E. WHITE - Wiley Publication.
8. ENVIRONMENTAL SCIENCE FUNDAMENTALS ETHICS AND LAWS by ASHISH SHUKLA, RENU SINGH & ANIL KUMAR - Wiley Publication.
9. NATURAL RESOURCES CONSERVATION by OLIVER S OWEN & CHIRAS
10. ECOLOGY OF NATURAL RESOURCES by RAMADE - Wiley Publication.
11. THE ECOLOGY OF NATURAL RESOURCES by SIMMONS - Edward Arnold Publication.

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Dheem
Anshul
Anshul
Sandeep
Amrita

M.Sc. Environmental Science

SEMESTER IV

ECM-401T: WATER MANAGEMENT

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Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) = 105

UNIT- I: POLLUTION ASSESSMENT AND CONTROL

- The oxygen balance in rivers and the impact of pollutants. Oxygen sag, reaeration, self-purification. Impact assessment.
- Assessment of pollution: BOD, COD, NOD, UOD, Coliform counts (MPN index).
- Biochemical assessment Indicator species (bio indicators), MPN index, knowledge of the Saprobian system and the Saprobian index.
- Eutrophication.
- Control of water pollution: primary, secondary and tertiary treatment, macrophyte based sewage treatment system (MSTS). Management strategies in protection and conservation of water.
- The Ganga and Yamuna action plan.

UNIT- II: CONSERVATION AND MANAGEMENT OF WATER RESOURCES

- Management strategies in water protection and conservation.
- Project formulation, environmental considerations, multi-purpose project.
- Conservation of water, rain water harvesting. National water policy: Salient features.
- Reclamation and conservation of wetlands.
- Modeling environmental impact assessment from case studies: the silent valley project; the Hubbard brook experience.
- Preparation of network diagrams to study impact of processes; mega dams and their impact on the environment.
- Pollution and its impact on the environment.
- Preparation of interaction matrix to show the relation between various parameters.

Internal assessment: 30 Marks

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REFERENCE BOOKS FOR ECM-401T:

1. ENVIRONMENTAL MANAGEMENT TEXT AND CASES BY BALA KRISHINAMOORTHY – PHI Publication.
2. NATURAL RESOURCES CONSERVATION OLIVER S. OWEN & CHIRAS - Pearson
3. ECOLOGY OF NATURAL RESOURCES BY RAMADE – Wiley Publication.
4. WATER POLLUTION BIOLOGY BY P. D. ABEL - John Wiley and Sons Publication.
5. FUNDAMENTALS OF ENVIRONMENTAL SCIENCES B. MUKHERJEE - Silverline Publication.
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Aushil
Shubh
Anur
Sandeep
Amrita dal

OR

M.Sc. Environmental Science

SEMESTER IV

ECM-401T: ENVIRONMENTAL MANAGEMENT:

There shall be three groups. Group A is compulsory and span over the entire subject of this paper in the form of multiple choices / true or false / fills in the blanks and will carry 20 marks. In group-B, 4 questions carry 5 marks each and in Group-C, 2 questions carrying 15 marks each are to be answered. Examinees will be required to answer questions from all the three groups.

Full Marks: (70+30) 100

Exam Duration: 2.5 Hours

Total Lectures: (75+30) = 105

UNIT- I: MODELING EIA

- Modeling global impacts for control and management.
- Mining and its impact on the environment.
- Resource use and its impact on the environment.
- Urbanization and its impact on the environment.
- agriculture and its impact on the environment.
- Deforestation and its impact on the environment.
- Case studies: river valley projects; thermal power plants; mining projects; oil refineries and petrochemicals; tourism coastal zone development

UNIT- II: CONSERVATION AND MANAGEMENT OF BIODIVERSITY

- Biodiversity, levels of biodiversity: ecological, evolutionary, genetic; types of biodiversity.
- Distribution, significance of biodiversity.
- Reduction of biodiversity.
- Conservation and management of biodiversity: need, steps, in-situ and ex-situ, and inter-situ conservation.
- Management strategies: national parks, sanctuaries, botanic gardens, gene banks. IUCN categorization of threatened species. Wild life management.

Internal assessment: 30

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REFERENCE BOOKS FOR ECM-401T:

1. ENVIRONMENTAL MANAGEMENT TEXT AND CASES BY BALA KRISHNAMOORTHY – PHI Publication.
2. NATURAL RESOURCES CONSERVATION OLIVER S. OWEN & CHIRAS - Pearson
3. ECOLOGY OF NATURAL RESOURCES BY RAMADE – Wiley Publication.
4. WATER POLLUTION BIOLOGY BY P. D. ABEL - John Wiley and Sons Publication.
5. FUNDAMENTALS OF ENVIRONMENTAL SCIENCES B. MUKHERJEE - Silverline Publication.
6. ECOLOGY OF FRESH WATER BY B. MOSS - Blackwell Publication.
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Coen
Sush
Anur
Anur
Sandeep
Anurita

M.Sc. Environmental Science

SEMESTER IV

CCM-401P + ECM-401P

PRACTICAL

Full Marks: 100

Exam Duration: 3 Hours

Total Lectures: $(75+30) = 105$

1. Assessment of water pollution

(30)

- Determination of BOD
- Determination of COD
- Determination of DOM

2. Determination of pollutants

(30)

- Determination of detergents
- Determination of fluorides
- Determination of MPN index
- Determination of chlorophyll

3. Statistical analysis of data on toxicology

(20)

4. Sessional work

(10)

5. Viva-voce

(10)

Dhruv Arlo
Anshul Sank
Sandeep Amrita Ad

M.Sc. Environmental Science

SEMESTER IV

CCM-401D

Full Marks: 100

Exam Duration: 3 Hours

Total Lectures: (75+30) = 105

DISSERTATION

Students can take up any project from the list mentioned below or they may develop their own innovative projects on environmental aspects:

Project development in coordination with environmental institution, agricultural institutions, nearby industries, central institutes and other NGO organizations. Students will be required to provide an explicit presentation of their work which will be certified by the concerned institution from which the training has been taken.

1. Basic ecosystem dynamics (productivity, energy flow, biogeochemical cycling, population dynamics)
2. Different aspects of pollution.
3. Environmental impact of mining projects.
4. Environmental impact of industrial projects.
5. Environmental impact of deforestation.
6. Impact of population increase on water resources.
7. Ground water recharge systems.
8. Impact of automobiles on the environment.
9. Creating environmental awareness among the local population.
10. Providing environmental education to the people.
11. Study of the age structure of the population of a particular area.
12. Project on mathematical modeling of environmental aspects.
13. Environmental biotechnology.
14. Environmental management.

The marks will be distributed as follows: 50 marks for the project report, 25 for written examination and 25 marks for viva-voce.

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