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**MODIFIED CBCS CURRICULUM OF  
M.Sc. ENVIRONMENTAL SCIENCE PROGRAMME**

**SUBJECT CODE = EVS**

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FOR POST GRADUATE COURSES UNDER RANCHI UNIVERSITY



Implemented w.e.f.  
Academic Session 2018-2020

## **Members of Board of Studies of CBCS P.G. Syllabus as per Guidelines of the Ranchi University, Ranchi.**

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Professor and Head  
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## COURSE STRUCTURE FOR M.Sc. ENVIRONMENTAL SCIENCE

**Table AI-1: Distribution of 80 Credits for Subjects having Practical Papers**

[\*wherever there is a practical examination there will be no tutorial and vice-versa.]

Course	Papers	Credits Theory + Practical	Credits Theory + Tutorial
<b>I. Foundation Course (FC)</b>			
1. Foundation Course Compulsory Foundation/ Elective Foundation	<b>(FC)</b> 1 Paper	1X5=5	1X5=5
<b>II. Core Course (CC)</b>			
Theory	<b>(CC 1 to 10/11)</b> 7 Papers/11 Papers	7X5=35	11X5=55
Practical/ Tutorial*	3 Papers/-----	3X5=15	
Project	1 Paper	1X5=5	1X5=5
<b>III. Elective Course (EC)</b>			
A. Ability Enhancement Course of the Core Course opted	<b>(AE/EC 1)</b> 1 Paper	1X5=5	1X5=5
B. Discipline Centric Elective Theory + Practical	<b>(DC/EC 2&amp;3)</b> 2 Papers 1 Paper	2X5=10 1x5=5	
OR Theory/Practical/Tutorial*	1Paper + 1 Practical/Dissertation		2X5=10
<b>OR Generic Elective/ Interdisciplinary (GE/EC 2&amp;3)</b>			
Theory OR	2 Papers		
Theory/Practical/Tutorial*	1 Paper + 1 Practical/Dissertation		
<b>Total Credit = 80</b>			<b>= 80</b>

**Table AI-1.1: Course structure for M.Sc Programme with Practical Papers**

Semester	Subject (Core Courses) 11 Papers	Allied (Elective Courses) 4 Papers	Foundation Course (Compulsory Course) 1 Paper	Total Credits
Sem-I	C-1, C-2, C-3 (5+5+5=15 Credits)		Foundation Course FC (05 Credits)	<b>20 Credits</b>
Sem-II	C-4, C-5, C-6, C-7 (5+5+5+5=20 Credits)			<b>20 Credits</b>
Sem-III	C-8, C-9, C-10 (5+5+5=15 Credits)	EC1 (05 Credits)		<b>20 Credits</b>
Sem-IV	C-11 (Project) (05 Credits)	EC2, EC3, EP (5+5+5=15Credits)		<b>20 Credits</b>
<b>Total = 80 Credits</b>				

**Table AI-2 Subject Combinations allowed for M. Sc. Programme (80 Credits)**

Core Subject CC 11 Papers	Discipline Centric Elective/ Generic Elective Course DC/ GE 3 Papers	Skill Enhancement Course SE 1 Paper	Foundation Course FC 1 Paper
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**Table AI-2.1 Semester wise Examination Structure for Mid Sem & End Sem Examinations:**

Sem				Core, SE/GE/DC & Compulsory FC Courses	Examination Structure		
	Paper	Paper Code	Credit	Name of Paper	Mid Semester Evaluation (F.M.)	End Semester Evaluation (F.M.)	End Semester Practical/ Viva (F.M.)
I	Foundation Course	FCEVS101	5	Fundamentals of Environmental Science and Environmental Factors	30	70	----
	Core Course	CCEVS102	5	Productivity Energy Flow and Biogeochemical Cycles	30	70	----
	Core Course	CCEVS103	5	Community Concept, Population and Biomes	30	70	----
	Practical's on Core	CPEVS104	5	Practical-I	----	----	70 + 30
II	Core Course	CCEVS201	5	The Habitat Concept	30	70	----
	Core Course	CCEVS202	5	Environmental Chemistry, Physics and Statistical Analysis of Data	30	70	----
	Core Course	CCEVS203	5	Environmental Pollution, Environmental Microbiology, Tools and Techniques	30	70	----
	Practical's on Core	CPEVS204	5	Practical-II	----	----	70 + 30
III	Ability Enhancement Course	ECEVS301	5	Soil Pollution, Noise Pollution, Radiation Pollution and Environmental Biotechnology	30	70	----
	Core Course	CCEVS302	5	Environmental Toxicology and Environmental Policy	30	70	----
	Core Course	CCEVS303	5	Global and Local Environmental Problems, Environmental Law and EIA	30	70	----
	Practical's on Core	CPEVS304	5	Practical-III	----	----	70 + 30
IV	Elective	ECEVS401	5	A. Water resource Management and Conservation -I B. Environmental Management -I	30	70	----
	Elective	ECEVS402	5	A. Water resource Management and Conservation -II B. Environmental Management -II	30	70	----
	Practical's on Elective	EPEVS403	5	A. Practical - Water resource Management and Conservation / B. Practical - Environmental Management	----	----	70 + 30
	PROJECT	PREVS404	5	Project Work	----	----	70 + 30

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**SEMESTER I**


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**4 Papers****Total 100 x 4 = 400 Marks****I. COMPULSORY FOUNDATION COURSE [FCEVS101]:**

(Credits: Theory-04, Tutorial-01)

**Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100****Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

***End Semester Examination (ESE):***

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks ).

**FUNDAMENTALS OF ENVIRONMENTAL SCIENCE AND ENVIRONMENTAL FACTORS**
**Theory: 60 Hours; Tutorial: 15 Hours****I Fundamentals of Environmental Science**

- Various disciplines of environmental science.
- Concept of: biosphere, biome, ecosystem, subdivisions of the biosphere: lithosphere, atmosphere, hydrosphere.
- Concepts pertaining to the ecosystem Ecosystem organization: structural and functional. Concept of trophic levels, food chains, food web. Comparison of ecosystem through number, biomass and energy pyramids. Concept of ecosystem dynamics; stability of ecosystems and control mechanisms: homeostasis, homeorhesis, microcosms and mesocosms.
- Impact of man on ecosystems.

**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.

**III Concept of Factors**

- Concept of environmental factors, adaptation to the environment, specialization and generalization.
  - Detailed study of the following factors: light, heat, carbon dioxide, and oxygen, with reference to its impact on the biota, and the recent changes that have occurred due to anthropogenic activity.
  - Concept of limiting factors and factor interaction, application of the knowledge for the benefit of mankind.
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**II. CORE COURSE [CCEVS102]:**

(Credits: Theory-04, Tutorial-01)

**Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100****Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

***End Semester Examination (ESE):***

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks ).

**PRODUCTIVITY ENERGY FLOW AND BIOGEOCHEMICAL CYCLES****Theory: 60 Hours; Tutorial: 15 Hours****I Concept of Biogeochemical Cycles**

- Elements and their distribution, concept of macro and micronutrients, cycling process and transfer routes, energy required; types of biogeochemical cycles: gaseous, sedimentary, local and global cycle's residence time, role of decomposers, dependence on the water cycle.
- Detailed study of the following cycles: water, oxygen, carbon, nitrogen, sulphur, phosphorus balance sheet and global budget of the normal process; impact of man on the cycling process.
- Concept of nutrient budgeting of ecosystems.

**II 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.

**III Energy Flow**

- Concept of energy, energy reaching the earth, light as an energy carrier, energy transduction with respect to the laws of thermodynamics, concept of entropy and enthalpy, the ecosystem as a thermodynamic unit. Energy base for plants, photosynthesis, energy fixation and production. Energy flow through the food chain, the 10 percent law,
- Lindeman's trophic dynamic aspect.
- Energy flow models: basic or universal model, energy flow models of ecosystems (aquatic and terrestrial), comparison of energy flow in different ecosystems.
- Energy flow through the detritus pathway, role of decomposers.



**III. CORE COURSE [CCEVS103]:**

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (MSE:17 + ESE:28)=45
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**Instruction to Question Setter:**Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks ).

**COMMUNITY CONCEPT, POPULATION AND BIOMES****Theory: 60 Hours; Tutorial:15 Hours****I Communities and Their Development**

- The community concept. 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.

**II Population Attributes, Growth and Interaction**

- Describing populations: natality, mortality, fecundity, survivorship, 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.

**III Biomes and Biogeography**

- Concept of biogeography, components of species diversity, species richness, and relative abundance.
  - Continental drift, dispersal dynamics, land bridges, endemism, biorealms.
  - 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.
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**IV. CORE COURSE PRACTICAL [CPEVS104]:**

(Credits: Practical-05)

**Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100****Pass Marks =45****Instruction to Question Setter:****End Semester Practical Examination (ESE Pr):**

The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

**Note:**

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks ).

**PRACTICAL-I****Practical: 60Hours****A. Measurement of various aquatic parameters (20)**

1. Determination of dissolved oxygen (Winkler's method) in a water sample.
2. Determination of carbon dioxide of a water sample.
3. Determination of alkalinity of a water sample.
4. Determination of chloride in a water sample.

**B. B. Measurement of nutrients in a water sample (20)**

1. Determination of nitrate in a water sample.
2. Determination of sulphate in a water sample.
3. Determination of phosphate in a water sample.

**C. Studies on animal adaptation and common equipment's for community studies 5×5 (25)****D. 1. Measurement of productivity in a water body. (15)  
2. Measurement of soil respiration.****Or****Community analysis**

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

**E. Practical record (10)****F. G. Viva- voce (10)**

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**SEMESTER II**


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**4 Papers****Total 100 x 4 = 400 Marks****I. CORE COURSE [CCEVS201]:**

(Credits: Theory-05)

<b>Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100</b>	<b>Pass Marks (MSE:17 + ESE:28)=45</b>
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**Instruction to Question Setter:****Mid Semester Examination (MSE):**

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

**End Semester Examination (ESE):**

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. “**Best of Two**” shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks ).

**THE HABITAT CONCEPT****Theory: 60 Hours; Tutorial: 15 Hours****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.

**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
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**II. CORE COURSE [CCEVS202]:**

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (MSE:17 + ESE:28)=45
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**Instruction to Question Setter:**Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

**ENVIRONMENTAL CHEMISTRY, PHYSICS AND STATISTICAL ANALYSIS OF DATA****Theory: 60 Hours; Tutorial: 15 Hours****I 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, Gibb's free energy, 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 glass pH electrode; buffers, buffering mechanism, conductivity.
- Beer's law.

**II Physical Principles**

- 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.
- Hygrometry: vapour pressure, dew point, absolute and relative humidity, wet and dry bulb hygrometer.
- Gas laws: specific heat, lapse rate.
- Electromagnetic radiation and light: definition and units, measurement of irradiance in the aquatic environment. Measurement of turbidity.

**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, selecting statistical sample size,
- Hypothesis testing. Test of significance or F-test, 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.
- Differentiation and integration, geometrical interpretation of a definite integral.
- Matrix algebra.

**IV Tools, Techniques and Environmental Microbiology**

- Principles and working of: pH meter, conductivity meter, DO meter, Hygrometer, Rain guage, Turbidimeter.
  - Spectroscopy: common spectrophotometer, flame photometer, atomic absorption spectrophotometer.
  - Chromatography: paper, TLC, HPLC.
  - Ecological groups of microorganisms, microbial interactions (associations) plant-microbe associations, animal-microbe associations, microbe-microbe interactions; soil microbiology, water microbiology, aeromicrobiology.
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**III. CORE COURSE [CCEVS203]:**

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100	Pass Marks (MSE:17 + ESE:28)=45
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**Instruction to Question Setter:**Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks ).

## **ENVIRONMENTAL POLLUTION, ENVIRONMENTAL MICROBIOLOGY, TOOLS AND TECHNIQUES**

**Theory: 60 Hours; Tutorial: 15 Hours**

**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.

**II Air Pollution**

- Evolution of the earth's atmosphere, structure of the atmosphere, composition of the atmosphere.
- Air pollution: dispersion and fate of atmospheric pollutants, sources: point and non-point sources; primary air pollutants and ambient air quality standards.
- 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.

**IV. CORE COURSE PRACTICAL [CPEVS204]:**

(Credits: Practical-05)

**Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100****Pass Marks =45****Instruction to Question Setter:****End Semester Practical Examination (ESE Pr):**

The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.

**Note:**

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks ).

**PRACTICAL-II****Practical: 60Hours****A. Aquatic**

(15)

1. Measurement of conductivity of a water sample.
2. Measurement of pH by a pH meter of a water or soil sample.
3. Measurement of total hardness of a water sample.
4. Measurement of silicate using a spectrophotometer.
5. BOD
6. COD

**B. Soil**

(15)

1. Measurement of water holding capacity of soil.
2. Measurement of soil organic matter.
3. Determination of available phosphorus.
4. Determination of soil nitrate.

**C. Plankton**

(30)

1. 1. Qualitative and quantitative analysis of plankton
2. Importance value index, species diversity

**Or****Quantitative analysis from datasets**

1. Correlation-regression simple
2. Multiple regression

**D. Tools and techniques**

2×10 = (20)

Working principle of: spectrophotometer, pH meter, conductivity meter, DO meter, Ekman's dredge, High volume sampler

**E. Practical record & Sessional work**

(10)

**F. Viva-voce**

(20)



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**SEMESTER III**


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**4Papers****Total 100 x 4 = 400 Marks****I. ABILITY ENHANCEMENT COURSE****[ECEVS301]:**

(Credits: Theory-04, Tutorial-01)

**Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100****Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

***End Semester Examination (ESE):***

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks ).

## **SOIL POLLUTION, NOISE POLLUTION, RADIATION POLLUTION AND ENVIRONMENTAL BIOTECHNOLOGY**

**Theory: 60 Hours; Tutorial:15 Hours****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.

**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

**III Noise Pollution, Radiation Pollution and Environmental Biotechnology.**

- 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.
  - 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, bioprobes.
-

**II. CORE COURSE [CCEVS302]:**

(Credits: Theory-04, Tutorial-01)

**Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100****Pass Marks (MSE:17 + ESE:28)=45****Instruction to Question Setter:****Mid Semester Examination (MSE):**

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

**End Semester Examination (ESE):**

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

**ENVIRONMENTAL TOXICOLOGY AND ENVIRONMENTAL POLICY****Theory: 60 Hours; Tutorial: 15 Hours****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

**II Effects of Toxicants and Assessment**

- Effect of toxic substances on organisms, types of effects: physiological, behavioural, mutagenic, and teratogenic. Effects at the cellular level.
- Genotoxicology, human toxicology, occupational safety and health administration.
- Toxicological testing methods. Assessment of toxicity: LD<sub>50</sub>, LT<sub>50</sub>,
- Statistical methods, probit units, toxic dose, dose-response relationship.
- Biomonitoring, bioindicators (indicator species).
- Environmental and occupational Health.

**III 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.

**IV 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.
- Disaster management

**V 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.
-

**III. CORE COURSE [CCEVS303]:**

(Credits: Theory-03, Practical-02)

**Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100****Pass Marks (MSE:17 + ESE:28)=45*****Instruction to Question Setter:******Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

***End Semester Examination (ESE):***

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. “**Best of Two**” shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd, 5 marks ).

## **GLOBAL AND LOCAL ENVIRONMENTAL PROBLEMS, ENVIRONMENTAL LAW AND EIA**

**Theory: 60 Hours; Tutorial: 15 Hours****I Local Environmental Issues**

- Use of pesticides, biomagnification and problems.
- Fertilizers and eutrophication,
- Wetlands and wastelands and their management.
- Photochemical smog;
- 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; acid rains; salinization.

**II Global Environmental issues**

- The ozone problem.
- 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.
- Natural disasters: earthquakes, hurricanes and floods; genetically engineered food; third world debt and disaster recovery.
- Economics and environment, climate, justice and equity.
- Disaster management.

**III Environmental Ethics and Environmental Law**

- Environmental ethics.
  - 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 environment (protection) Act, 1986;
  - The Scheme on Labeling of Environment Friendly Products (ECOMARK). S.O.195(E), [19/01/2009] –
  - **Environmental Impact Assessment Notification-2009.**
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**IV. CORE COURSE PRACTICAL [CPEVS304]:**

(Credits: Practical-05)

**Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100****Pass Marks =45*****Instruction to Question Setter:******End Semester Practical Examination (ESE Pr):***

*The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.*

***Note:***

*(Attendance Upto60%, 1mark; 60<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks ).*

**PRACTICAL-III**

- |  |      |
|--|------|
| <b>A. Assessment of water pollution</b>              | (25) |
| 1. Determination of BOD                              |      |
| 2. Determination of DOM                              |      |
| <b>B. Determination of pollutants</b>                |      |
| A. 1. Determination of detergents                    | (25) |
| B. Determination of fluorides                        |      |
| C. Determination of MPN index                        |      |
| D. Determination of chlorophyll                      |      |
| <b>C. Statistical analysis of data on toxicology</b> | (20) |
| <b>D. Practical record &amp; Sessional work</b>      | (10) |
| <b>E. Viva- voce</b>                                 | (20) |
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**SEMESTER IV**
**4 Papers****Total 100 x 4 = 400 Marks**
**I. GENERIC/DISCIPLINE CENTRIC ELECTIVE [ECEVS401A]:**  
 (Credits: Theory-04, Tutorial-01)

<b>Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100</b>	<b>Pass Marks (MSE:17 + ESE:28)=45</b>
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***Instruction to Question Setter:******Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

***End Semester Examination (ESE):***

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

**WATER RESOURCE MANAGEMENT AND CONSERVATION -I****Theory: 60 Hours; Tutorial: 15 Hours****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.

**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.
-



**OR****GENERIC/DISCIPLINE CENTRIC ELECTIVE****[ECEVS401B]:**

(Credits: Theory-04, Tutorial-01)

**Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100      Pass Marks (MSE:17 + ESE:28)=45****Instruction to Question Setter:**Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. “**Best of Two**” shall be applicable for computation of marks for SIA.

(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks ).

**ENVIRONMENTAL MANAGEMENT -I****Theory: 60 Hours; Tutorial: 15 Hours****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.

**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 peoples movement to save the environment.
- Global conferences to combat environmental problems (COP<sub>3</sub>-COP<sub>15</sub>); environment and health.

## II. GENERIC/DISCIPLINE CENTRIC ELECTIVE [ECEVS402A]: (Credits: Theory-04, Tutorial-01)

<b>Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100</b>	<b>Pass Marks (MSE:17 + ESE:28)=45</b>
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### ***Instruction to Question Setter:***

#### ***Mid Semester Examination (MSE):***

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

#### ***End Semester Examination (ESE):***

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

## **WATER RESOURCE MANAGEMENT AND CONSERVATION -II**

**Theory: 60 Hours; Tutorial: 15 Hours**

### **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 (bioindicators), 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.

### **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.

**OR****GENERIC/DISCIPLINE CENTRIC ELECTIVE****[ECEVS402B]:**

(Credits: Theory-04, Tutorial-01)

**Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100****Pass Marks (MSE:17 + ESE:28)=45****Instruction to Question Setter:**Mid Semester Examination (MSE):

There will be **two** groups of questions in written examinations of 20 marks. **Group A is compulsory** and will contain five questions of **very short answer type** consisting of 1 mark each. **Group B will contain descriptive type five** questions of five marks each, out of which any three are to be answered.

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type six** questions of fifteen marks each, out of which any four are to be answered.

**Note:** There may be subdivisions in each question asked in Theory Examinations

The Mid Semester Examination shall have three components. (a) Two Semester Internal Assessment Test (SIA) of 20 Marks each, (b) Class Attendance Score (CAS) of 5 marks and (c) Class Performance Score (CPS) of 5 marks. "**Best of Two**" shall be applicable for computation of marks for SIA.

(Attendance Upto 75%, 1 mark; 75 < Attd. < 80, 2 marks; 80 < Attd. < 85, 3 marks; 85 < Attd. < 90, 4 marks; 90 < Attd., 5 marks).

**ENVIRONMENTAL MANAGEMENT -II****Theory: 60 Hours; Tutorial: 15 Hours****I Modeling EIA for Management**

- 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

**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.

**III. GE/DC PRACTICAL [EPEVS403A]:**

(Credits: Practical-05)

**Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100****Pass Marks =45*****Instruction to Question Setter:******End Semester Practical Examination (ESE Pr):***

*The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.*

***Note:***

*(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks ).*

**WATER RESOURCE MANAGEMENT AND CONSERVATION PRACTICAL -IV**

- |   |            |
|---|------------|
| A. Determination of COD                         | (20)       |
| B. Determination of Arsenic                     | (20)       |
| C. Determination of turbidity                   | (10)       |
| D. Identification and comments on bioindicators | 4×5 = (20) |
| E. Practical record & Sessional work            | (10)       |
| F. Viva-voce                                    | (20)       |
-

**OR****GE/DC PRACTICAL [EPEVS403B]:**

(Credits: Practical-05)

**Marks: 30 (ESE: 20 Viva + 5Attd. + 5 Record) + 70 (ESE Pr: 6Hrs)=100****Pass Marks =45*****Instruction to Question Setter:******End Semester Practical Examination (ESE Pr):***

*The questions in practical examination will be of equal to 70 marks and will be so framed that the students are able to answer them within the stipulated time. 20 marks will be awarded on the performance in viva voce whereas 10 marks will be awarded on cumulative assessment which is further subdivided as 5 marks for Practical record and 5 marks for Attendance.*

***Note:***

*(Attendance Upto75%, 1mark; 75<Attd.<80, 2 marks; 80<Attd.<85, 3 marks; 85<Attd.<90, 4 marks; 90<Attd, 5 marks ).*

**ENVIRONMENTAL MANAGEMENT PRACTICAL -IV**

- A. Quantitative analysis from datasets** (30)
1. Correlation-regression simple
  2. Multiple regression
- B. Species diversity calculation from plankton data** (20)
- C. Practical record & Sessional work** (10)
- D. Viva-voce** (20)
- E. Mini Project based on any one of the following aspects:** (20)

**Water Resources**

1. Water resources: basic aspects
2. Water pollution
3. Eutrophication
4. Aquatic biota
5. Saprobity index

**Management**

1. Ground water resources of your area
2. Problem of deforestation
3. Environmental education and awareness
4. Waste management
5. Management of biodiversity
6. Transportation and use of fuel

The project should be performed to identify the problem, the impact on the environment and suggested measures for management of the system.

**IV. CORE COURSE (PROJECT) [PREVS404]:**

(Credits: 05)

**Marks : 100 (ESE: 3Hrs)=100****Pass Marks =45*****Guidelines to Examiners for******End Semester Examination (ESE):***

*Overall project dissertation may be evaluated under the following heads:*

- *Motivation for the choice of topic*
- *Project dissertation design*
- *Methodology and Content depth*
- *Results and Discussion*
- *Future Scope & References*
- *Participation in Internship programme with reputed organization*
- *Application of Research technique in Data collection*
- *Report Presentation*
- *Presentation style*
- *Viva-voce*

**PROJECT WORK**

Each student has to submit two copies of the dissertation work duly forwarded by the HOD of Department concerned. The forwarded copies will be submitted in the Department of Zoology, Ranchi University, for evaluation (Seven days before the seminar).

The paper will consist of

- (a) Field work/Lab work related to the project.
- (b) Preparation of dissertation based on the work undertaken.
- (c) Presentation of project work in the seminar on the assigned topic in the P.G. Department of Zoology, Ranchi University, Ranchi & open viva there on.

**Topics**

Project work related to the following Industrial/socially relevant topics may be given or students may develop their own innovative projects on environmental aspects:

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.

**NB:-** Students will select topics for the project work in consultation with a teacher of the department. The Seminar will be held in the Department of Zoology, Ranchi University, Ranchi.

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**RECOMMENDED READINGS**

- Abel, P.D. 1989: Water pollution biology. John Wiley and Sons, New York.
  - Alloway, B.J. and Ayres, D.C. 1993: Chemical principles of environmental pollution.
  - Atlas, R.M. 1985: Microbiology, Fundamentals and Application. Macmillan, New York.
  - Bakus, G.J. 1990: Quantitative ecology and Marine biology. Oxford and IBH, New Delhi.
  - Barrington, E.J.W. 1980: Environmental biology. Edward Arnold, London.
  - Baruah, T.C and Barthakur, H.P. 1997: A text book of soil analysis. Vikas, New Delhi.
  - Batschelet, E. 1975: Introduction to mathematics for life scientists. Springer-Verlag, New York.
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DISTRIBUTION OF CREDITS FOR P.G. PROGRAMME (SEMESTER-WISE) FOR  
POSTGRADUATE 'P.G. Voc./M.Sc./M.A./M.Com' PROGRAMME

**Table B-1: Semester wise distribution of 80 Credits for Subjects with Practical Papers.**

Semester	CC	FC	GE/DC	AE	Total credits
Semester I	15	05			20
Semester II	20				20
Semester III	15			05	20
Semester IV	5		15		20
	<b>55</b>	<b>05</b>	<b>15</b>	<b>05</b>	<b>80</b>

**Table B-1: Semester wise distribution of 80 Credits for Subjects without Practical Papers.**

Semester	CC	FC	GE/DC	AE	Total credits
Semester I	15	05			20
Semester II	20				20
Semester III	15			05	20
Semester IV	10		10		20
	<b>60</b>	<b>05</b>	<b>10</b>	<b>05</b>	<b>80</b>

CC=Core Course; FC=Foundation Compulsory/Elective Course; GE=Generic Elective; SE=Skill Enhancement Course; DC=Discipline Centric Elective



**SAMPLE CALCULATION FOR SGPA & CGPA FOR POSTGRADUATE 'P.G.  
Voc./M.Sc./M.A./M.Com' PROGRAMME**

**Table B-2: Sample calculation for SGPA for M.Sc./M.A./M.Com Programme**

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)	SGPA (Credit Point/Credit)
<b>Semester I</b>					
FC	05	A	8	40	
C-1	05	B+	7	35	
C-2	05	B	6	30	
C-3/CP	05	B	6	30	
<b>Total</b>	<b>20</b>			<b>135</b>	<b>6.60 (135/20)</b>
<b>Semester II</b>					
C-4	05	B	6	30	
C-5	05	C	5	25	
C-6	05	B+	7	35	
C-7/CP	05	A+	9	45	
<b>Total</b>	<b>20</b>			<b>135</b>	<b>6.60 (135/20)</b>
<b>Semester III</b>					
EC-1	05	A+	9	45	
C-8	05	O	10	50	
C-9	05	A	8	40	
C-10/CP	05	A	8	40	
<b>Total</b>	<b>20</b>			<b>175</b>	<b>8.75 (175/20)</b>
<b>Semester IV</b>					
EC-2/EC-2	05	B	6	30	
EC-3/EC-3	05	A+	9	45	
C11/EP	05	B	6	30	
Project	05	A+	9	45	
<b>Total</b>	<b>20</b>			<b>150</b>	<b>7.50 (150/20)</b>
<b>CGPA</b>					
<b>Grand Total</b>	<b>80</b>			<b>595</b>	<b>7.44 (595/80)</b>

**Table B-3: Sample calculation for CGPA for P.G. Vocational M.Sc./M.A./M.Com Programme**

Semester I	Semester II	Semester III	Semester IV
Credit:20; SGPA:6.60	Credit:20; SGPA: 6.60	Credit:20; SGPA: 8.75	Credit:20; SGPA: 7.50

**Thus CGPA= (20x6.60+20x6.60+20x8.75+20x7.50) /80=7.36**

## DISTRIBUTION OF MARKS FOR EXAMINATIONS AND FORMAT OF QUESTION PAPERS

**Distribution of Marks for Mid Semester Evaluation:****Table No. 15:** Distribution of marks of Theory Examinations of Mid Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A	Group B
Mid Sem*	T30*	30 (20 +5 +5)	17	1 Hr	5 x1 =5	3 (out of 5) x5 =15	05	5

**\*There shall be 20 marks theory examination for mid sem, 05 marks for attendance/ regular interactions & 05 marks for seminar/ assignment/ term paper given by faculty concerned in classrooms.**

**Distribution of Marks for End Semester Theory Examinations:****Table No. 16:** Marks distribution of Theory Examinations of End Semester

Topic	Code	Full Marks	Pass Marks	Time	Group-A# (Very short answer type Compulsory Questions) No. of Questions x Marks = F.M.	Group-B (Descriptive Questions) No. of Questions x Marks = F.M.	Total No. of Questions to Set	
							Group A#	Group B
End Sem	T50	50	--	3 Hrs	2 x5 =10	2 (out of 3) x20 =40	2	3
	T70	70	28	3 Hrs	Q.No.1 (5x1) + 1x5 =10	4 (out of 6) x15 =60	2	6

**# Question No.1 in Group-A carries very short answer type questions of 1 Mark**

**Note :** There may be subdivisions in each question asked in Theory Examinations.

## FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

20 MARKS



## Ranchi University, Ranchi

Mid Sem No.Exam Year

Subject/ Code

F.M. =20Time=1Hr.

### General Instructions:

समान्य निर्देश :

- i. **Group A** carries very short answer type compulsory questions.  
(खंड 'A' में अत्यंत लघु उत्तरीय अनिवार्य प्रश्न हैं।)
- ii. **Answer 3 out of 5** subjective/ descriptive questions given in **Group B**.  
(खंड 'B' के पाँच में से किन्हीं तीन विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
- iii. Answer in your own words as far as practicable.  
(यथासंभव अपने शब्दों में उत्तर दें।)
- iv. Answer all sub parts of a question at one place.  
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
- v. Numbers in right indicate full marks of the question.  
(पूर्णांक दायीं ओर लिखे गये हैं।)

### Group A

1. .... [5x1=5]
2. ....
3. ....
4. ....
5. ....

### Group B

6. .... [5]
7. .... [5]
8. .... [5]
9. .... [5]
10. .... [5]

**Note:** There may be subdivisions in each question asked in Theory Examination.

## FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

50 MARKS



## Ranchi University, Ranchi

End Sem No.Exam Year

Subject/ Code

F.M. =50

### General Instructions:

- i. **Group A** carries very short answer type **compulsory** questions.
- ii. **Answer 2 out of 3** subjective/ descriptive questions given in **Group B**.  
(खंड 'B' के तीन में से किन्हीं दो विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
- iii. Answer in your own words as far as practicable.  
(यथासंभव अपने शब्दों में उत्तर दें।)
- iv. Answer all sub parts of a question at one place.  
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
- v. Numbers in right indicate full marks of the question.  
(पूर्णांक दायीं ओर लिखे गये हैं।)

### Group A

- |         |  |     |
|---------|--|-----|
| 1. .... |  | [5] |
| 2. .... |  | [5] |

### Group B

- |         |  |      |
|---------|--|------|
| 3. .... |  | [20] |
| 4. .... |  | [20] |
| 5. .... |  | [20] |

**Note:** There may be subdivisions in each question asked in Theory Examination.

## FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

70 MARKS



## Ranchi University, Ranchi

End Sem No.Exam Year

**Subject/ Code**

**F.M.** =70**P.M.** =28**Time**=3Hrs.**General Instructions:**

- i. **Group A** carries very short answer type **compulsory** questions.
- ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B**.  
(खंड 'B' के छः में से किन्हीं चार विषयनिष्ठ/ वर्णनात्मक प्रश्नों के उत्तर दें।)
- iii. Answer in your own words as far as practicable.  
(यथासंभव अपने शब्दों में उत्तर दें।)
- iv. Answer all sub parts of a question at one place.  
(एक प्रश्न के सभी भागों के उत्तर एक साथ लिखें।)
- v. Numbers in right indicate full marks of the question.  
(पूर्णांक दायीं ओर लिखे गये हैं।)

**Group A**

1. [5x1=5]
- i. ....
- ii. ....
- iii. ....
- iv. ....
- v. ....

2. .... [5]

**Group B**

3. .... [15]
4. .... [15]
5. .... [15]
6. .... [15]
7. .... [15]
8. .... [15]

**Note:** There may be subdivisions in each question asked in Theory Examination.