BSc (Zoology)

Paper – II: Ecology and Environmental Biology

Section –A

Ecology

Definition and scope of Ecology.

Environmental Factors: Abiotic factors, biotic factors, edaphic factors.

Concept of ecosystem with reference to pond ecosystem. Energy flow in ecosystem. Pyramids of number, biomass and energy. Food chain- grazing and detritus, Food web and trophic levels. Biosphere: Hydrosphere, Lithosphere and Atmosphere. Biogeochemical cycles: Carbon and Nitrogen cycles.

Population: Definition and characteristics: density, natality, mortality, migration, emigration and immigration, growth and growth-curves. Dispersion and aggregation. Negative and positive interactions including commensalism, mutualism, predation, competition and parasitism.

Section – B

Environmental Biology

Biodiversity: Conservation and management of biodiversity.

Brief introduction to the concept of protected areas- Sanctuary, National Parks and Biosphere Reserves. IUCN and Red data book.

Pollution and its control: Air, Water, Soil pollution, Green house effect, Global warming, Climate change, Acid rain, Ozone layer depletion.

Bio-accumulation and Biomagnifications.

MSc (Zoology)

M.Sc I Sem. – Microbiology
II – Non-chordata – SM
III – Ecology – RK Singh
IV – Taxonomy D.P.
V Mole
B
– SM

Paper III – Ecology

Section – A

Ecology: Its relevance to human welfare, subdivisions and scope. The Environment: physical environment; biotic environment; biotic and abiotic interactions, ecosystem diversity, ecosystem services

Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realised niche; resource partitioning; character displacement

Ecosystem's structure and function: Abiotic and biotic components of aquatic (Lake) and Terrestrial (forest) ecosystems, primary and secondary productivity, movement of energy and materials, energy efficiency, thermal stratification and circulation in lake, Lake's typology

Limiting factors: Laws of limiting factors, impact of temperature, moisture and pH on organisms

Population Ecology: Characteristics of a population; population growth curves, population regulation; life history strategies (r and K selection); concept of meta-population-demes and dispersal, intertdemic extinctions, age structured

Community Ecology: Community nomenclature, completion, community attributes namely dominance, various types of diversity indices, similarity coefficient, ecotone and edge effect

Ecological Succession: Types; mechanisms, changes involved in succession, concept of climax

Section – B

Stressed ecosystems: Point and non-point sources of pollution, assessment of freshwater pollution using various parameters; Water quality monitoring using abiotic factors (e.g. pH, oxygen, nitrate, ammonia, phosphate, BOD), bio monitoring (phytoplankton, zooplankton and zoo benthos), Environmental Impact Assessment (EIA)-impact of environmental stress on biotic and abiotic factors

Europhication: Its causes, assessment, consequences and control; Indicators of pollution and eutrophication

Global Environmental Problems: Climate change, Global warming, acid rains, greenhouse effects, ozone layer depletion

Biodiversity: Status, monitoring and documentation; major drivers of biodiversity change; biodiversity conservation and management, project tiger, biosphere reserves

Conservation Ecology: Principles of conservation, major approaches to management, Indian case studies on conservation and management programs (National Lake Conservation Program; "Namami Gange Pariyojana" and Ganga Action Plan); theory of island biogeography

SEMESTER IV

PAPER-3
ECONOMICS GROWTH AND DEVELOPMENT

PAPER CODE : 1243

Conceptual Framework and Methodology of Modern Growth Theories. The Harrod- Domar Growth Model. Neo-Classical Growth Theory. Growth Models of Solow, Meade and Swan. Cambridge Theories of Growth- Joan Robinson, Kaldor, Kahn.

Models of Technical Progress – Hicks, Harrod. Optimal Savings and Ramsay's Rule. Golden Rule of Accumulation. Money in Economic Growth . Endogenous Growth.

Development Policies and Perspectives: Role of Economic and Non-Economic Factors. Sectoral Priorities and Development Policies. Environment and Development.

International Trade, Aid, Finance in Development. Technology Transfer and Multinational Corporations. Problems of Unemployment and Poverty in Developing Economies.

Recommended Reading (Latest Editions) :

1.Ghatak, S., (1986), An Introduction to Development Economics, Allen and Unwin, London.
2.Thriwall, A. P., (1978), Growth and Development, McMillan, London.
3.Meier, G.M., (1984) : Leading Issues in Economic Development, Oxford University Press, New
4Higgins, B. (1959) : Economic Development, Norton , New York
5.Kindlerberger, C.P. and B. Harrik (1983) : Economic Development, McGraw-Hill, Tokyo.
6.Salvatore, D. and E. Dowling (1977) : Development Economics, Schuam's Outline Series in Economics, McGraw
7.Agarwal, A. N. and S.P. Singh, (Eds.) (1985) : Economics of Underdevelopment O.U.P., Lon.
8.Adelman I (1969) : Theories of Economic Growth and Development, Stanford University Press, Stanford
9.Sen, A.K. (ed.) (1971) : Growth Economics, Penguin, Harmondsworth.
10.Sundaram, R.M. (1984) : Development Economics : A Framework for Analysis and Policy.
11.Chenery, H. : Redistribution with Growth, Oxford University Pre
12.Todaro, M.P. : Economic Development, Longman, Lond
13.United Nations : Human Development Report.
14.Misra, S.K.&V.K. Puri, Economics of Growth and Development, Himalaya Publishing House, Mumbai.
15ण्ण्एम0 एल0 डिंगन, विकास का अर्थशास्त्र एवं आयोजन, वृन्दा पब्लिकेशन, नई दिल्ली।

BEDS3312B1: Environmental Education

Maximum Marks: 50

Mode of Examination/Assessment: Internal and External

Internal Marks-15 **External Marks-35**

Course Objectives: The present course is aimed to attain following objectives:

1. To develop understanding with respect to environmental issues surrounding us.
2. To make student-teachers aware of ecosystem, disaster/natural calamities and their management.
3. To make student-teachers understand the role of teachers, students and community in protection and conservation of environment

Learning outcomes: The pupil-teacher will:

1. Develop understanding of his/her role in environmental conservation.
2. Acquire global understanding of issues related to climate change.
3. Develop sensitivity towards his responsibility for environmental conservation.
4. Be able to organize various activities for conservation of environment.
5. Be able to analyze various factors responsible for environmental degradation.
6. Know about various organizations/agencies contributing in environmental conservation.
7. Be able to discuss techniques for reducing adverse effects of climate change.

Course Content:

Unit- 1: Teacher as an educator and conservator of Environment.

- Meaning of Environment, Objectives of Environmental sensitization, Teacher as an Educator of Environmental Education.
- Role of Teacher and students in conservation of Environment.
- Analysis of Environmental Pollution with reference to Causes, Effects and Remedies: Water Pollution, Land Pollution, Air Pollution, Noise Pollution
- Learning motivational techniques to sensitize students towards environment: Formation of Environment club, Cleanliness campaign, Poster competition, Quizzes, Awareness Rallies, Nukkad Nataks, Project based on Environmental Problems, Creative Activities, Celebration of Environment Day, Celebration of cultural festivals related to Environment, Plantation Programme, Environmental Protection Movements.
- Environmental Hazards: Natural calamity and types of disasters.

Unit- 2: Climate Change: Causes, Consequences and Remedies.

- Concept of climate change: Meaning and Definition, Causes of climate change.
- Consequences of climate change on Biodiversity, Oceans, Glaciers, Forests, Human Life, Weather and Agriculture.
- Techniques for reducing adverse effects of climate change.
- Environmental protection and conservation: Role of National and International agencies, Role of school and community, Disaster management.

Practicum: Some of the following or similar activities, to be selected by subject-teacher(s), will be organized:

- Awareness activities: Quiz/ Cleanliness campaign/ poster competition/ Rallies etc.
- Preparing project report related to eco system, sustainable development.
- Unit test/ Assignment/ case studies etc.
- Survey of village/community for assessing environment related issues and learning motivational techniques.
- Plantation, Identification & conservation of local water resources.
- Poster competition, Quiz, *Nukkad Natak*.
- Case study of disaster areas.
- Workshop, Seminars, Group Discussion etc.

Books Recommended:

Archana Tomar-Environmental Education.
K.Nagarajan-Environmental Education.
C.Periannan- Environmental Education.
Rajeshwar Garg and K.C.Jain-Environmental Education.
R.A.Sharma,Premlata Maisnam,Samir kumar-Environmental Education.

SEMESTER IV

PAPER-3
ECONOMICS GROWTH AND DEVELOPMENT

PAPER CODE : 1243

Conceptual Framework and Methodology of Modern Growth Theories. The Harrod- Domar Growth Model. Neo-Classical Growth Theory. Growth Models of Solow, Meade and Swan. Cambridge Theories of Growth- Joan Robinson, Kaldor, Kahn.

Models of Technical Progress – Hicks, Harrod. Optimal Savings and Ramsay's Rule. Golden Rule of Accumulation. Money in Economic Growth . Endogenous Growth.

Development Policies and Perspectives: Role of Economic and Non-Economic Factors. Sectoral Priorities and Development Policies. Environment and Development.

International Trade, Aid, Finance in Development. Technology Transfer and Multinational Corporations. Problems of Unemployment and Poverty in Developing Economies.

Recommended Reading (Latest Editions) :

1.Ghatak, S., (1986), An Introduction to Development Economics, Allen and Unwin, London.
2.Thriwall, A. P., (1978), Growth and Development, McMillan, London.
3.Meier, G.M., (1984) : Leading Issues in Economic Development, Oxford University Press, New
4Higgins, B. (1959) : Economic Development, Norton , New York
5.Kindlerberger, C.P. and B. Harrik (1983) : Economic Development, McGraw-Hill, Tokyo.
6.Salvatore, D. and E. Dowling (1977) : Development Economics, Schuam's Outline Series in Economics, McGraw
7.Agarwal, A. N. and S.P. Singh, (Eds.) (1985) : Economics of Underdevelopment O.U.P., Lon.
8.Adelman I (1969) : Theories of Economic Growth and Development, Stanford University Press, Stanford
9.Sen, A.K. (ed.) (1971) : Growth Economics, Penguin, Harmondsworth.
10.Sundaram, R.M. (1984) : Development Economics : A Framework for Analysis and Policy.
11.Chenery, H. : Redistribution with Growth, Oxford University Pre
12.Todaro, M.P. : Economic Development, Longman, Lond
13.United Nations : Human Development Report.
14.Misra, S.K.&V.K. Puri, Economics of Growth and Development, Himalaya Publishing House, Mumbai.
15ण्ण्एम0 एल0 डिंगन, विकास का अर्थशास्त्र एवं आयोजन, वृन्दा पब्लिकेशन, नई दिल्ली।

BOTANY

CURRICULAM-SEMESTER SYSTEM

M. Sc. Course in Botany Syllabus, Kumaun University, Nainital

Semester System with effect from July 2014-2015 onwards

Semester System Course Structure

Total four Semesters

Total Marks -2000

III Semester (Max. Marks: 570)

Theory Papers (Max. marks: 400)

	Marks
Paper IX: Plant Ecology	100
Paper X: Cytogenetics and Plant Breeding	100
Paper XI: Plant Biotechnology	100
Paper XII: Plant Physiology and Biochemistry	100
Practical	170
Total	**570**

IV Semester (Max. Marks: 290)

Theory Papers (Max. marks: 200)

	Marks
Paper XIII: Plant Resource, Utilization and Conservation	100
Paper XIV: Elective Courses:	100

(i) Forest Ecology

(ii) Plant Pathology

(iii) Taxonomy of Angiosperms

(iv) Ethnobotany, Traditional Knowledge and Intellectual Property Rights

(v) Bryology

(vi) Environmental Botany

(The Students will opt any one out of six elective courses)
Dissertation and Project Work: (In IV Semester 'Dissertation/Project' is compulsory)

Practical (Paper XIII: 40 Marks + Elective Course: 50 Marks)	90
Total	**290**

III Semester

Paper IX: Plant Ecology

- **Climate, soil and vegetation patterns of the world**: Major biomes and vegetation types and environmental factors.
- **Population dynamics:** Characters, r and k strategies.
- **Vegetation organization:** Concepts of community and continuum; community character, concept of ecological niche, ordination.
- **Ecological succession:** Causes, mechanism and types, concepts of climax.
- **Ecosystem:** Structure and functions; primary production (methods of measurement, global pattern, controlling factors); energy dynamics (Trophic organization, energy flow pathways, ecological efficiencies); litter fall and decomposition (mechanism, substra quality and climatic factors); global biogeochemical cycles of C, N, P and S; (pathways, processes, in terrestrial and aquatic ecosystems; nutrient use efficiency, hydrological cycle.
- **Biological diversity:** Concept and levels; species richness, diversity indices, concept of α and β diversity, role and application of biodiversity in ecosystem function; speciation and extinction; IUCN categories of threat; distribution and global patterns of biodiversity, hot spots; inventory.
- **Environmental pollution:** Kinds; sources, quality parameters; effects on plants and ecosystems and remedies.
- **Climate change:** Greenhouse gases sources, trends and role; ozone layer and ozone hole; consequences of climate change (CO; sequestration, global warming, sea level rise, UV radiation).

IV Semester

Paper XIII: Plant Resource Utilization and Conservation

- **Sustainable development:** Basic concepts.
- World centres of primary and secondary diversity of domesticated plants.
- **Uses of important plants** (i) Food, forage, fodder and fibre crops. (ii) Medicinal and aromatic plants and (iii) Vegetable oil yielding plants.
- **Important fire-wood and timber-yielding plants and non-timber forest products (NTEPs)** such as bamboos, rattans, raw materials for paper-making, gums, tannins, dyes, resins and fruits.
- **Green revolution:** Benefits and adverse circumstances.
- Plants used as avenue trees for shade, pollution control and aesthetics.
- Conservation of plant biodiversity: Principles of conservation, extinction, environmental status of plants based on international Union for conservation of Nature (IUCN).

- Strategies for *in-situ* conservation: International efforts and Indian initiatives; protected areas in India- sanctuaries, national parks, biosphere reserves, wetlands, mangroove and coral reefs for conservation of wild biodiversity.
- Strategies for *ex-situ* conservation: Principles and practices; botanical gardens, field gene banks, in vitro repositories, cryobanks; general account of the activities of Botanical Survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and industrial Research (CSIR), and the department of Biotechnology (DBT) for conservation, non-formal conversation efforts.

DEPARTMENT OF BOTANY

B. Sc.

(Semester System)

SYLLABUS

3 Year Programme

(2 Paper Pattern)

To be applicable from, July 2019

KUMAUN UNIVERSITY

NAINITAL

B. Sc. Botany

I Semester

Max. Marks: 200

Paper I: Algae and Bryophyta	80 (60+20)
Paper II: Fungi and El. Microbiology	80 (60+20)
Practical	40 (30+10)
Total	**200**

II Semester

Max. Marks: 200

Paper III: Pteridophyta and Gymnosperm	80 (60+20)
Paper IV: Ecology and Biostatistics	80 (60+20)
Practical	40 (30+10)
Total	**200**

Bot. 202: PAPER –IV ECOLOGY AND BIOSTATISTICS

Max. Marks: 80

1. Plant and environment: Principles of environment, atmosphere, light, temperature, water, soil.
2. Morphological, anatomical and physiological responses of plants to water (Hydrophytes and Xerophytes): temperature (thermoperiodism and vernalization): light (heliophytes and sciophytes).
3. Population: Growth curves, ecotype and ecads.
4. Definition of community, Structure and attributes of community: frequency, density, cover, life forms and biological spectrum, ecological succession.
5. Ecosystem concept, energy flow, food chain, food web and ecological pyramids.
6. Biogeochemical cycles with emphasis on carbon and nitrogen cycles.
7. Preliminary idea of environmental pollution-air, water, soil, noise and radioactive pollution.

Bot. 203: Lab course (Practical)

Max. Marks: 40

Pteridophyta

A. To study the anatomical features of the following material and identify them: *Lycopodium, Sellaginella, Equisetum,* fern sorus, *Adiantum*

B. To comment upon the specimens/slides given.

Gymnosperm

A. To study the anatomical features of the following material and identify them: leaflet, Pine needle, Pine stem (T.S., T.L.S., R.L.S.), male and female cone of *Pinus*, *Ephedra*

B. To comment upon the specimens/slides given.

7

Ecology and Biostatistics

A. To calculate the frequency, abundance, density and A/F ratio of the given data.

B. To calculate the relative frequency, relative density, relative abundance and IVI of the given data by quadrat method and by developing artificial vegetation plots.

C. To determine the leaf area of the given leaves.

D. To calculate net primary productivity of a grass land

E. To Study the soil pH and soil moisture content.

F. To develop population structure diagram

NATIONAL EDUCATION POLICY-2020

Common Minimum Syllabus for all Uttarakhand State Universities and Colleges for First Three Years of Higher Education

PROPOSED STRUCTURE OF

UG - BOTANY

SYLLABUS

2021

Semester-wise Titles of the Papers in B. Sc (Botany)					
Year	**Semester**	**Course Code**	**Paper title**	**Theory/ Practical**	**Credits**
Certificate Course in Basic Botany					
First Year	I	BOT101T	Microbes, Algae, Fungi and Bryophytes	Theory	4
		BOT102P	Practical/Lab course	Practical	2
	II	BOT201T	Pteridophytes, Gymnosperms and Angiosperms	Theory	4
		BOT202P	Practical/Lab course	Practical	2
Diploma Course in Developmental Botany					
Second Year	III	BOT301T	Morphology and Anatomy	Theory	4
		BOT302P	Practical/Lab course	Practical	2
	IV	BOT401T	Embryology and Cytogenetics	Theory	4
		BOT402P	Practical/Lab course	Practical	2
Bachelor of Science					
Third Year	V	BOT501T	Molecular Biology and Plant Biotechnology	Theory	4
		BOT502T	Economic Botany and Plant Breeding	Theory	4
		BOT503 P	Practical/Lab course	Practical	2
		BOT504R	Project I-Local Plant Diversity	Practical	4
	VI	BOT 601T	Physiology and Biochemistry	Theory	4
		BOT602T	Ecology and Biostatistics	Theory	4
		BOT603P	Practical/Lab course	Practical	2
			Project II-Local Ecosystem studies	Practical	4

Year wise Structure of B.Sc. in Botany (Core/elective courses and Projects)

Subject: Botany

Course/ Entry-Exit level	Year	Semester	Paper-1	Credits/hrs	Paper-2	Credits/ hrs	Paper-3	Credits/hrs	Research project	Credits /hrs	Total Credits/hrs
Certificate Course in Basic Botany	I	I	Microbes, Algae, Fungi and Bryophytes	4/60	Practical/ Lab course	2/60	-	-	-	-	6/120
		II	Pteridophytes, Gymnosperms and Angiosperms	4/60	Practical/ Lab course	2/60	-	-	-	-	6/120
Diploma Course in Developmental Botany	II	III	Morphology and Anatomy	4/60	Practical/ Lab course	2/60	-	-	-	-	6/120
		IV	Embryology and Cytogenetics	4/60	Practical/ Lab course	2/60	-	-	-	-	6/120
Bachelor of Science	III	V	Molecular Biology and Plant Biotechnology	4/60	Economic Botany and Plant Breeding	4/60	Practical /Lab course	2/60	Project-I	4/60	14/240
		VI	Physiology and Biochemistry	4/60	Ecology and Biostatistics	4/60	Practical /Lab course	2/60	Project-II	4/60	14/240

Paper 2: Ecology and Biostatistics (Course code: BOT602T) Credit: 4

Course outcome

1. Acquaint the students with complex interrelationship between organisms and environment;
2. Make them understand methods for studying vegetation, community patterns and processes, ecosystem functions, and principles of phytogeography.
3. Understanding the strategies for sustainable natural resource management and biodiversity conservation.
4. Practical knowledge of the different statistics tools and techniques.

Unit	Topic	No. of Lectures (60 hrs)
1	**Ecological factors:** **Soil (Origin, formation, composition, soil profile)** **Plant adaptation** in relation to water (Hydrophytes and xerophytes), light (Sciophytes and heliophytes) and temperature **Pollution: Water, Soil and Radioactive.**	12

2	**Ecosystem: Types, structure, energy flow, trophic organization, food chains and food webs, ecological pyramids.** **Biogeochemical cycles: Cycling of carbon, nitrogen and phosphorous.** **Population: Characteristics, Growth curves, Ecotypes and Ecads** **Plant communities: Characteristics, plant succession, Biological spectrum** **Biodiversity conservation**	18
3	**Biostatistics:** Definition and scope of statistics, sampling techniques, representation of data: tabular, graphical etc **Measures of central tendency:** Arithmetic mean, mode, median.	18
4	**Measures of dispersion:** range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit Regression analysis	12

Suggested reading

SEMESTER – II

Code: 202 (GMP-CCM-ii)

URBAN ENVIRONMENT AND PLANNING

Paper – Second

Term End Exam. Marks	: 75	Time: 03 Hours
Internal Assessment Marks	: 25	(20 Marks allotted for Internal Assessment by Submitting Two Assignments for Evaluation & 05 marks for attendance and overall performance in the class.)
Total Marks	**: 100**	

Unit – I	**Theoretical Base:** Basic concepts, meaning, scope of urban geography and planning, Significance of urban development planning in geography. Evolution of urban centres and Urbanization. Recent trends of urban growth with special reference to developing countries, Urban sprawl and its steering factors, Satellite towns.
Unit –II	**Morphology and Functions:** Urban morphology, Urban land use analysis and classification, Urban landscape. Functions of urban centres, Functional classifications of towns with special reference to India and Uttarakhand.
Unit – III	**Central Place System:** Towns as central places, Central places theory, Centrality and hierarchy of urban centres, Urbanization and regional development.
Unit – IV	**Urban Environmental Problems:** Environmental problems of urbanizations, Carrying capacity of urban settlements, Urbanization and global environmental change, Assessment of natural risks of urban growth with particular reference to developing countries, India and High mountains.
Unit – V	**Urban Planning and Management:** Concept and approaches of urban development, Landscape ecology and sustainable urban development, urban land use planning, management of natural risks of urban growth in Uttarakhand, Application of remote sensing and Geographic Information System in Urban Development Planning.

Books Recommended:

1. Alam, S.M. (1964) : Hyderabad – Secunderabad Twin Cities, Asia Publishing House, Bombay.
2. Berry, B.J.L. and Horton, F.F. (1970) : Geographic Perspective on Urban Systems, Prentice Hall, Englewood Cliffs, New Jersey.

SEMESTER – III

Code : 301 (GMP-CCM – i)

ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT

Paper – First

Term End Exam. Marks : 75 Time: 03 Hours

Internal Assessment Marks : 25 (20 Marks allotted for Internal Assessment by Submitting Two Assignments for Evaluation & 05 marks for attendance and overall performance in the class.)

Total Marks : 100

Unit – I	**Conceptual Base:** Environment: Concepts and Types; Environmental Perception; Environment and Society; Meaning, Scope and Significance of Environmental Geography; Approaches to the Study of Environmental Geography.
Unit – II	**Environmental Problems:** Types of environmental problems; causes and consequences of environmental problems at global regional and local levels; Global environmental change; Natural disasters; Environmental Impact Assessment (EIA).
Unit – II	**Sustainable Development:** Concepts of Sustainable Development; Need of Sustainable Development; Sustainable Mountain Agriculture and Livelihood.
Unit –IV	**Environmental Management:** Concept of Environmental Management; Approaches to Environmental Management; Integrated Watershed Management; Disaster Management
Unit – V	**Environmental Management in Uttarakhand Himalaya:** Environmental Changes – Causes & Consequences; Environmental Planning & Sustainable Development; Disaster Management; Climate Change and Adaptation

Books Recommended:

1. Ahmad,Y.J., G.K. Sammy (1985): Guidelines to EIA in Developing Countries. Hordder & Stoughton, London.

SEMESTER – III

Code : 304 (GMP-EC-i)

CLIMATE CHANGE, IMPACTS AND ADAPTATION IN HIMALAYA

Paper – Fourth (a)

Term End Exam. Marks : 75 Time: 03 Hours

Internal Assessment Marks : 25 (20 Marks allotted for Internal Assessment by Submitting Two Assignments for Evaluation & 05 marks for attendance and overall performance in the class.)

Total Marks : 100

Unit –I	**Elements of Climate:** Nature and Scope and Relationship with other Sciences; Understanding Climate Change; Concept of Climate Change; Global Trends of Climate Change; Assessment of Climate Change over mountains.
Unit – II	**Trends of Climate Change in Himalaya:** Himalaya as Climate Change Hot Spot; Trends of Climate Change in Himalaya: Rainfall, Temperature and Extreme Weather Events.
Unit – III	**Climate Change Induced Natural Disasters:** Understanding Linkages between Climate Change and Natural Disasters; Droughts and High Intensity Rainfall and their impacts on natural environment, society and economy
Unit – IV	**Climate Change Vulnerability and Risk**: Concept of Vulnerability and Risk; Assessment of Climate Change Vulnerability and Risk; Upstream-downstream linkage of Climate Change
Unit – V	**Climate Change Adaptation in Himalaya:** Concept of Climate Change Adaptation; Types of Climate Adaptation; Role of Local Institutions in climate Change Adaptation; Mainstreaming Climate Change Adaptation and Disaster Risk Reduction into Development Planning; Community Based Climate Change Adaptation.

Books Recommended:

1. P. Wester, A. Mishra, A. Mukherji, A. B. Shrestha (eds), The Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People, Springer Nature Switzerland AG, Cham. pp., 2019
2. World Bank, South Asia's Hotspots Impacts of Temperature and Precipitation Changes on Living Standards, Report Preview Spring 2018, World Ban Group, Washington D.C. 2018
3. S. Irudaya Rajan, R. B. Bhagat eds, Climate Change, Vulnerability and Migration, Routledge, India, 2018
4. M.S.S. Rawat et al. (eds), Environment, Resources and Development of the Indian Himalaya, Transmedia Publication, Srinagar, Garhwal, Uttarakhand, India, 2018
5. Tor H. Aase, Climate Change and the Future of Himalayan Farming, Oxford University Press, 2017

SEMESTER – IV

Code : 406 (GMP- EC – iii)

DISASTER MANAGEMENT

Paper – Fourth (c)

Term End Exam. Marks	: 75	Time: 03 Hours
Internal Assessment Marks	: 25	(20 Marks allotted for Internal Assessment by Submitting Two Assignments for Evaluation & 05 marks for attendance and overall performance in the class.)
Total Marks	**: 100**	

Unit – I	**Fundamentals of Disaster Management:** The significance of disaster, Disaster threat, National disaster management policy, Major requirements for coping with disaster, Disaster and disaster management cycle,
Uni t – II	**Long term Measures:** Prevention, Mitigation, Preparedness, Disaster and development, Disaster legislature, Counter disaster resources, Disaster management plans, Utilization of resources.
Unit – III	**Response to Disaster Impact:** Response; Search, Rescue and Evacuation, Logistic; Incident command system.
Unit – IV	**Major Post impact Factors:** Recovery, Post disaster review and damage assessment, Relief, Rehabilitation and Restructuring
Unit – V	**Regional Pattern of Disaster Management:** International disaster assistance, Leadership in disaster, Organization, Disaster scenario of Uttarakhand, Disaster management system in Uttarakhand.

Kumaun University, Nainital
SYLLABUS FOR ENVIRONMENTAL STUDIES COURE
(for undergraduate classes)

Unit 1 : The Multidisciplinary Nature of Environmental Studies

- Definition, scope and importance
- Need for public awareness of environmental degradation: Disaster Management; floods, earthquake, cyclone and landslides.

(2 lectures)

Unit 2: Natural Resources: Renewable and non-renewable:

- Forest resources: Use and over-exploitation-deforestation. case studies. Timber
- extraction, mining, dams and their effects on forests and tribal people.
- Water resources : Use and overutilization of surface and ground water. Floods, drought conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources and case studies.
- Food resources: World food problems, changes caused by agriculture and overgrazing, effect of modern agriculture, fertilizer- pesticide problems, water logging, salinity, and case studies.
- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- Land resources: land as aresource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems

(6 lectures)

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types characteristic features, structure and function of the following ecosystems :-

  a. Forest ecosystem.
  b. Grassland ecosystem.
  c. Desert ecosystem.
  d. Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit 4: Biodiversity and its Conservation

- Introduction:-Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity : global, national and local level.
- India as a mega-diversity nation.
- Hot spots of biodiversity .
- Threats to biodiversity :habitat loss, poaching of wildlife, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In situ and ex-situ conservation of biodiversity.

(5 lectures)

Unit 5: Environmental Pollution

- Definition, causes, effects and control measures of :-
- Air pollution, water pollution, soil pollution, marine pollution, noise pollution thermal pollution, nuclear hazards.
- Solid waste management: causes, effect and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies.

(5 lecture)

Unit 6: Social Issues and the Environment

- From unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people : its problems and concerns. case studies.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection.
- Air (Prevention and control of Pollution) Act.
- Water (Prevention and control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

(7 lectures)

Unit 7: Human Population and the Environment

- Population growth, variation among nations
- Population explosion-family welfare programme.
- Environment and human health
- Human right.
- Value education.
- HIV/AIDS.
- Women and child welfare.
- Role of Information Technology in Environment and Human Health. case Studies

(4 lectures)

Note: (a) Information on environmental assets and common plants, insects and birds shall be given in the respective lectures in the above mentioned units.

(b) The paper of this course for Kumaun University Examination shall be of 50 marks. Examinee is not required to submit the project.

(c) The grades as per marks scored in the examination shall be determined as under:

A^+	more than 75% marks
A	60 - 75 % marks
B	45 - 59.9 % marks
C	30 - 44.9 % marks
F	less than 30% (Fail)

The examinee shall have to pass (minimum 'C' grade) the examination.

(d) Candidate who have failed or have not appeared in the examination of 2007 may also appear in 2008.

(e) The Campuses / Institutes / Affiliated colleges shall ensure teaching of prescribed syllabus with the help of subject experts.

कुमाऊँ विश्वविद्यालय, नैनीताल

पर्यावरण अध्ययन (स्नातक कक्षाओं हेतु) का पाठ्यक्रम, 2007–08

इकाई 1: पर्यावरण अध्ययन की बहुशास्त्रीय प्रकृति

- परिभाषा, विषयक्षेत्र और महत्त्व
- जन–जागरूकता और आवश्यकता: आपदा प्रबन्ध: बाढ़, भूकम्प, चक्रवात और भूस्खलन।

(2 व्याख्यान)

इकाई 2: प्राकृतिक संसाधन : नवीकरणीय और अनवीकरणीय संसाधन

- वन्य संसाधन: उपयोग और अति–दोहन,वनविनाश, केस अध्ययन,इमारती लकड़ी की कटाई, खनन, बाँध तथा वनों और जनजातीय लोगों पर प्रभाव
- जल संसाधन: भूजल और भूमिगत जल का उपयोग और अति–शोषण, बाढ़, सूखा, जल संबंधी विवाद, बाँध: लाभ और समस्याएँ
- खनिज संसाधन: उपयोग और दोहन, खनिज संसाधनों के दोहन और उपयोग का पर्यावरण पर प्रभाव, केस अध्ययन
- खाद्य संसाधन : विश्व की खाद्य समस्याएँ, कृषि और अत्यधिक चराई से उत्पन्न परिवर्तन, आधुनिक कृषि के प्रभाव, खादों और कीटनाशकों की समस्याएँ, जलभराव, खारापन, केस अध्ययन।
- ऊर्जा संसाधन: ऊर्जा की बढ़ती आवश्यकताएँ, ऊर्जा नवीकरणीय और अनवीकरणीय स्रोत, ऊर्जा के वैकल्पिक स्रोतों का उपयोग:, केस अध्ययन।
- भूमि संसाधन: भूमि एक संसाधन के रूप में, भूमि का ह्रास, मानवकृत भूस्खलन, मृदा अपरदन और मरुस्थलीयकरण
- प्राकृतिक संसाधनों के संरक्षण में व्यक्ति की भूमिका
- निर्वहनीय जीवनशैलियों के लिए संसाधनों का समतामूलक उपयोग (5 व्याख्यान)

ईकाई 3: पारितंत्र

- पारितंत्र की अवधारणा
- पारितंत्र की संरचना एवं कार्य
- उत्पादक, उपभोक्ता और अपघटक
- पारितंत्र में ऊर्जा का प्रवाह
- पारितंत्रों का क्रम
- खाद्य-शृंखला, खाद्य-जाल और पिरामिड
- निम्न का परिचय, प्रकार, बुनियादी विशेषता, संरचना एवं कार्य

क) वन्य पारितंत्र
ख) चारागाही पारितंत्र
ग) मरुस्थली पारितंत्र
घ) जलीय पारितंत्र (तालाब, नालें, झीलें, नदियाँ, समुद्र, नदमुख) (5 व्याख्यान)

इकाई 4: जैवविविधता और उसका संरक्षण

- परिचयः परिभाषाः जननिक, प्रजातीय पारितंत्री
- भारत का जैव-भौगोलिक वर्गीकरण
- जैव-विविधता का मूल्यः उपयोग मूल्य, उत्पादक मूल्य, सामाजिक, नैतिक, सौंदर्यात्मक और विकल्पी मूल्य
- अंतर्राष्ट्रीय, राष्ट्रीय और स्थानीय स्तरों पर जैव-विविधता
- विराट-विविधता वाले राष्ट्र के रूप में भारत
- जैव-विविधता के मुख्यस्थल
- जैव-विविधता का संकटः आवास क्षति, वन्य प्राणियों का शिकार, मानव वन्यजीवन टकराव
- भारत की संकटग्रस्त और स्थानिक प्रजातियाँ
- जैवविविधता का संरक्षण : यथास्थल और बहिःस्थल (4 व्याख्यान)

इकाई 5 : पर्यावरण प्रदूषण

- परिभाषा प्रदूषण के कारण, प्रभाव और नियंत्रण के उपाय :-
  वायु प्रदूषण, जल प्रदूषण, मृदा प्रदूषण, समुद्री प्रदूषण, ध्वनि प्रदूषण, ताप प्रदूषण तथा परमाणविक जोखिम।
- ठोस अपशिष्ट का प्रबंधः नगरीय और औद्योगिक अपशिष्ट के कारण, प्रभाव और नियंत्रण के उपाय
- प्रदूषण की रोकथाम में व्यक्ति की भूमिका
- प्रदूषण संबंधी केस अध्ययन (4 व्याख्यान)

इकाई 6 : सामाजिक मुद्दे और पर्यावरण

- अनिर्वहनीय से निर्वहनीय विकास की ओर
- ऊर्जा से संबंधित नगरीय समस्याएँ
- जल संरक्षण, वर्षाजल का संचय, जलविभाजक प्रबंध
- जनता का पुनर्वास; इसकी समस्याएँ और सरोकार केस अध्ययन
- पर्यावरण संबंधी नैतिकताः मुद्दे और संभावित समाधान
- जलवायु परिवर्तन, विश्वव्यापी ऊष्णता, अम्लीय वर्षा, ओज़ोन पर्त का ह्रास, नाभिकीय दुर्घटनाएँ और विनाश। इनसे सम्बन्धित केस अध्ययन

- ऊसर का उद्धार
- उपभोक्ता और अपशिष्ट पदार्थ
- पर्यावरण (संरक्षण) अधिनियम
- वायु (प्रदूषण निरोध एवं नियंत्रण) अधिनियम
- जल (प्रदूषण निरोध एवं नियंत्रण) अधिनियम
- वन्यजीवन संरक्षण अधिनियम
- वन संरक्षण अधिनियम
- पर्यावरण अधिनियमों के क्रियान्वयन से जुड़े मुद्दे
- जन- जागरुकता

(6 व्याख्यान)

इकाई 7: मानव जनसंख्या और पर्यावरण

- जनसंख्या वृद्धि, विभिन्न राष्ट्रों में अंतर
- जनसंख्या और मानव विस्फोट : परिवार कल्याण कार्यक्रम
- पर्यावरण और मानव -स्वास्थ्य
- मानवाधिकार
- मूल्य शिक्षा
- एच आई वी/एड्स
- महिला और बाल कल्याण
- पर्यावरण और मानव स्वास्थ्य में सूचना प्रौद्योगिकी की भूमिका
- केस अध्ययन (उपर्युक्त पर आधारित)

(4 व्याख्यान)

टिप्पणी : (अ) पर्यावरणीय संपदाओं से सम्बन्धित तथा आम पौधों, कीड़ों और परिंदों के बारे में जानकारी सम्बन्धित उपर्युक्त इकाईयों के व्याख्यानों में दी जायेगी।

(ब) विश्वविद्यालय की परीक्षा में स्नातक स्तर पर अनिवार्य पर्यावरण-पाठ्यक्रम का प्रश्न पत्र 50 अंकों का होगा। परीक्षार्थियों को प्रोजेक्ट जमा नहीं करना होगा।

(स) प्राप्तांको के आधार पर निम्नांकित ग्रेड दिये जायेंगे तथा उत्तीर्ण होना (न्यूनतम ''सी'' ग्रेड प्राप्त करना) अनिवार्य होगा :-

ए$^+$	75	प्रतिशत से अधिक प्राप्तांक
ए	60-75	प्रतिशत प्राप्तांक
बी	45-59.9	प्रतिशत प्राप्तांक
सी	30-44.९	प्रतिशत प्राप्तांक
एफ	30	प्रतिशत से कम (अनुत्तीर्ण)

(द) वर्ष 2007 की परीक्षा में पर्यावरण विज्ञान विषय में परीक्षा से वंचित अथवा अनुत्तीर्ण परीक्षार्थी वर्ष 2008 की परीक्षा में सम्मिलित हो सकेंगे।

(य) सभी परिसर/संस्थान/सम्बद्ध महाविद्यालय विषय-विशेषज्ञों द्वारा निर्धारित पाठ्यक्रम का शिक्षण कार्य सुनिश्चित करेंगे।