SUPPORTING DOCUMENTS FOR 1.3.2

1.3.2 Number of courses that include experiential learning through project work/fieldwork/internship during the year

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Ability Enhancement Course (AEC-I) compulsory course for all undergraduate courses

Ability Enhancement course (AEC), Skill Enhancement Course, (SEC) & Value Addition Course (VAC) These three courses shall be a pool of courses offered by all the Departments in groups of odd and even semesters from which students can choose. A student who desires to make Academic Project/Entrepreneurship as Minor has to pick the appropriate combination of courses of GE, SEC, VAC, & Internship/Apprenticeship/Project/Community (IAPC) which shall be offered in the form of various modules as specified in the scheme of studies.

AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are Language and Literature and Environmental Science and Sustainable Development which will be mandatory for all disciplines.

Syllabus of Environmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

ANNEXURE-I

Ability Enhancement Compulsory Course

Ability Enhancement Course on Environmental Science: Theory into Practice (I & II) at UG level (AEC I) Course Learning Outcomes

6.0 The course will empower the undergraduate students by helping them to.

i. Gain in-depth knowledge on natural processes and resources that sustain life and govern economy.
ii. Understand the consequences of human actions on the web of life, global economy, and quality of human life.
iii. Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
iv. Acquire values and attitudes towards understanding complex environmental-economic- social challenges, and active participation in solving current environmental problems and preventing the future ones.
v. Adopt sustainability as a practice in life, society, and industry.

6.1 Year - 1

Ability Enhancement Course on Environmental Science: Theory into Practice (I) — at UG level (AEC-I)

Unit 1

Introduction to Environmental Studies (2 lectures and 3 practical/ outreach activities)

- Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere
- Scope and importance; Concept of sustainability and sustainable development; Brief history of environmentalism

Suggested Readings

1. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment,* 8th Edition. Wiley Publishing, USA. Chapter 1 (Pages: 1-17); Chapter 2 (Pages: 22-23); Chapter 3 (Pages: 40, 41); Chapter 4 (Pages: 64, 66).
2. Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi. Chapter 1 (Page: 3-28).

Practical/Exercises/Experiential activities/Outreach activities
(College may choose as per requirement)
1. Analysis of achievement of Sustainable Development Goals of any country.
2. Gain insights of sustainability framework for an industrial acitivty using activity worksheets
3. Use of environmental activity worksheets to understand interdependence and interactionsbetween different environmental components.

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(दिल्ली विश्वविद्यालय)
Shivaji College
(University of Delhi)
NAAC ACCREDITED "A" GRADE COLLEGE

Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

Unit 2

Ecosystems (6 lectures and 6 practical/ outreach activities)

- **Definition and concept of Ecosystem**
- **Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), and Biogeochemical (nutrient cycling) processes. Concepts of productivity, ecological pyramids and homeostasis.**
- **Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India**
- **Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration.**

Suggested Readings

1. **Odum, E.P., Odum, H.T., and Andrews, J. (1971). *Fundamentals of Ecology*. Saunders, Philadelphia, USA. Chapter 1 (Pages: 1-16); Chapter 2 (Pages: 18-76); Chapter 10 (Pages: 414-458).**
2. **Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. Chapter 3 (Pages: 38-52); Chapter 4 (Pages: 53-62); Chapter 5 (Pages: 100-103); Chapter 6 (Pages: 106-128).**
3. **Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation. S.* Chand Publishing, New Delhi. Chapter 13 (Pages: 307-323); Chapter 18 (Pages: 420-442); Chapter 28 (Pages: 747-769).**

Practical/Exercises/Experiential activities/Outreach activities

(College may choose as per requirement)

1. **Schematic collection of data for depicting ecological pyramids in the College campus**
2. **Differentiation of natural and managed ecosystems using Google Earth/Google Map**
3. **Field visit to terrestrial and aquatic ecosystems (forests, grasslands, wetlands,biodiversity parks, etc.)**
4. **Develop a working model of any ecosystem**
5. **Use of worksheets to identify structure and function of different ecosystems.**

Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

Unit 3

Natural Resources (8 lectures and 6 practical/ outreach activities)

- **Land resources: Minerals, soil, agricultural crops, natural forest products, medicinal plants, and forest-based industries and livelihoods; Land cover, land use change, land degradation, soil erosion, and desertification; Causes of deforestation; Impacts of mining and dam building on environment, forests, biodiversity, and tribal communities**
- **Water resources: Natural and man-made sources; Uses of water; Over exploitation of surface and ground water resources; Floods, droughts, and international &inter- state conflicts over water**
- **Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source**
- **Case studies: Contemporary Indian issues related to mining, dams, forests, energy, etc (e.g., National Solar Mission, Cauvery river water conflict, Sardar Sarovar dam, Chipko movement, Appiko movement, Tarun Bharat Sangh, etc)**

Suggested Readings

1. **Gadgil, M. and Guha, R. (1993). *This Fissured Land: An Ecological History of India.* University of California Press, Berkeley, USA. (pp. 1-245).**
2. **McCully, P. (1996). *Rivers no more. the environmental effects of dams, I* n: *Silenced Rivers: The Ecology and Politics of Large Dams,* Zed Books, New York, USA. Page. 29-64.**
3. **Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). Environment, 9th Edition. Wiley Publishing, USA. Chapters 10, 11, 12, 13 (Pages: 180-263); Chapter 14 (Pages: 272-275); Chapter 15 (Pages: 286-289).**
4. **Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi. Chapter 25 (Pages: 623-663).**

Practical/Exercises/Experiential activities/Outreach activities (College may choose as per requirement)

1. **Visit to a paper recycling unit/rainwater harvesting plant/solar plant/biogas plant in the College campus**
2. **Develop and understand working model of renewable/non-renewable sources ofenergy**
3. **Mapping of natural resources of a given study area using Google Earth**
4. **Time-series analysis of natural resource consumption of a given country usingpublicly available data**
5. **Comparison of energy demand and consumption of a particular state over the years using graphical tools.**

(Continued)

Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

Unit 4
Environmental Pollution (8 lectures and 6 practical/ outreach activities)

- **Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, andcontrols; Primary and secondary air pollutants; Air and water quality standards**
- **Nuclear hazards and human health risks**
- **Solid waste management: Control measures for various types of urban, industrialwaste, Hazardous waste, E-waste, etc; Waste segregation and disposal**
- **Pollution case studies: Ganga Action plan (GAP), Delhi air pollution and public healthissues, Plastic waste management rules, Bhopal gas tragedy, etc**

Suggested Readings

1. **Brusseau, M.L., Pepper, I.L. and Gerba, C.P. (2019). *Environmental and Pollution Science,* 3rdEdition. Academic Press, USA. Chapter 16 (Pages: 243-255); Chapter 18 (Pages: 280-305); Chapter 21 (Pages: 352-358); Chapter 22 (Pages: 365-374); Chapter 23 (Pages: 378-388); Chapter 25 (Pages: 416-426).**
2. **Carson, R. (2002). Silent Spring. Houghton Mifflin Harcourt, USA. Pp. 1-264.**
3. **Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). Environment, 9th Edition. Wiley Publishing, USA. Chapter 19 (Pages: 359-381); Chapter 21 (Pages: 401-421); Chapter 23 (Pages: 440-453).**
4. **Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi. Chapters 19, 20, 12 (Pages: 445-535).**

Practical/Exercises/Experiential activities/Outreach activities
(College may choose as per requirement)

1. **Determine water quality of a given location using rapid pollution monitoring kits**
2. **Assess air quality index (AQI) of any location using real-time air quality parameters**
3. **Determine magnitude of solid waste generated in a home/college on a monthly basis**
4. **Develop and maintain compost/vermicompost using biodegradable waste in the College**
5. **Identify suitability of given water samples for various purposes using given kits**
6. **Prepare water audit report of the college/house/locality/colony.**
7. **Map solid and liquid discharge of the college/colony and develop a management plan(show it using schematic diagram, and photographs.**
8. **Repurpose waste for economic and environmental benefits in your college/near byarea/colony (submit a small video).**
9. **Analyze river-society-economy nexus based on primary or secondary data (usequantitative data, and show it using photographs on a poster).**

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Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

Year — 2
Ability Enhancement Course on
Environmental Science: Theory into Practice (II) — at UG level (AEC-II)

Unit S
Global Environmental Issues and Policies (7 lectures 8 practical/ outreach activities)

- Causes of Climate change, Global warming, Ozone layer depletion, and Acid rain; Impacts on human communities, biodiversity, global economy, and agriculture
- International agreements and programmes: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity (CBD), Ramsar convention, TheChemical Weapons Convention (CWC), UNEP, CITES, etc.
- Sustainable Development Goals: India's National Action Plan on Climate Change and its major missions
- Environment legislation in India: Wildlife Protection Act, 1972; Water (Prevention andControl of Pollution) Act, 1974; Forest (Conservation) Act 1980; Air (Prevention & Control of Pollution) Act, 1981; Environment Protection Act, 1986; Scheduled Tribesand other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

Suggested Readings

1. Divan, S. and Rosencranz, A. (2002). *Environmental Law and Policy in India: Cases, Material & Statutes,* 2nd Edition. Oxford University Press, India. Chapter 2 (Pages: 23-39); Chapter 3 (Pages: 41-86).
2. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment,* 9th Edition. Wiley Publishing, USA. Chapter 19 (Pages: 370-376); Chapter 20 (Pages: 385-399).
3. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi. Chapter 23 (Pages: 555-598); Chapter 30 (Pages: 801-807).

Practical/Exercises/Experiential activities/Outreach activities
(College may choose as per requirement)
1. Depict temperature/precipitation trend of a given study area using online data
2. Formulate questionnaire/online surveys for assessment of the impact of climate change onpeople
3. Assess Nationally Determined Contributions (NDCs) of developed and developing countries
4. Development and simulation of Model UNFCCC for inoculating negotiation skills at climatechange summits
5. Development and simulation of Moot Court for Mock Trials in Negotiation Green Tribunal
6. Identify carbon footprint of your college/home/locality (refer wwf@envis.nic.in).

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Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

Unit 6

Biodiversity and Conservation (8 lectures and 8 practical/ outreach activities)

- **Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity**
- **India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories**
- **Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples; sacred groves and their importance with examples**
- **Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis**
- **Biodiversity conservation strategies: in-situ and ex-situ methods of conservation; National Parks, Wildlife Sanctuaries, and Biosphere reserves; Keystone, Flagship, Umbrella, and Indicator species; Species reintroduction and translocation**
- **Case *studies:* Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)**

Suggested Readings

1. Primack, R.B. (2014). *Essentials of Conservation Biology,* Oxford University Press, USA. Page. 1-536.
2. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment,* 9th Edition. Wiley Publishing, USA. Chapter S (Pages: 97-99); Chapter 16 (Pages: 299-318).
3. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. Chapters 24 (Pages: 599-690); Chapter 26 (Pages: 664-714).

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Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

Practical/Exercises/Experiential activities/Outreach activities
(College may choose as per requirement)

1. **Acquaintance with open-source databases of biodiversity**
2. **Determine species location in a given study area**
3. **Depict distribution of biodiversity across latitude and altitude**
4. **Show species distribution across space and time**
5. **Quantify species loss across different time periods**
6. **Sampling of plant and animal biodiversity of the College campus**
7. **Identification of the floral diversity of Delhi and other states.**
   Documentation of the plants by clicking pictures, finding out the scientific names/ local names through literature or mobile applications, identification of their conservation status (IUCN red book list), medicinal properties, water consumption status, and socio-economic-environmental importance. A short report to be submitted)
8. **Exercise to understand the socio-economic-environmental impact of wildlife conservation.**
   (Students can choose any global animal species and identify the relevance of the species for the ecosystem/ society/ culture/ local economy, historic or present range of the species, emerging threats due to human activities, identification of documented events of natural disasters/ conflicts/ poaching of the species in the present range, conservation status (IUCN red book list), identification of protected areas/ programs of the government/ international organisation, and their opinion to further improve the conservations of the species. A short report to be submitted.

Unit 7
Human Communities and the Environment (6 lectures and 7 practical/ outreach activities)

- **Human population growth: Impacts on environment, human health, and welfare;Carbon foot-print**
- **Resettlement and rehabilitation of developmental project affected persons andcommunities; relevant case studies**
- **Environmental movements: Chipko movement, Appiko movement, Silent valley movement, Bishnois of Rajasthan, Narmada Bachao Andolan, etc**
- **Environmental justice: National Green Tribunal and its importance**
- **Environmental philosophy: Environmental ethics; Role of various religions and cultural practices in environmental conservation**
- **Environmental communication and public awareness: case studies (e.g., CNG vehicles in Delhi, Swachh Bharat Abhiyan, National Environment Awareness Campaign (NEAC), National Green Corps (NGC) "Eco-club" programme, etc)**

Suggested Readings

1. **Divan, S. and Rosencranz, A. (2002). Environmental Law and Policy in India: Cases, Material & Statutes, 2nd Edition. Oxford University Press, India. Chapter 10 (Pages: 416-473).**
2. **Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). Environment, 9thEdition. Wiley Publishing, USA. Chapter 2 (Pages: 33-36);**

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Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

Practical/Exercises/Experiential activities/Outreach activities
(College may choose as per requirement)

1. **Assessment of carbon foot-print of different countries using online databases andmathematical tools**
2. **Visit to marginalized localities and students for environmental education and environmentalawareness**
3. **Formulation of questionnaire/online surveys for assessment of the impact of environmentaleducation**
4. **Visit to any developmental project affected locality for assessing the impacts of economic development on human lives**
5. **Correlation analysis of human population growth and impacts on the environment andhuman health**

6.2 Essential Readings

1. **Brusseau, M.L., Pepper, I.L., and Gerba, C.P. (2019). *Environmental and PollutionScience,* 3rd Edition. Academic Press, USA. (pp. 1-520).**
2. **Divan, S. and Rosencranz, A. (2002). Environmental Law and Policy in India: Cases,Material & Statutes, 2nd Edition. Oxford University Press, India. (pp. 1-837).**
3. **Gadgil, M., and Guha, R. (1993). *This Fissured Land: An Ecological History of India.* University of California Press, Berkeley, USA. (pp. 1-245).**
4. **Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment,* 8th Edition. Wiley Publishing, USA. (pp. 1-472).**
5. **Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi. (pp.1-842).**

6.3 Weekly Lesson Plan

(Year 1)Weeks 1 -2
Multidisciplinary nature of environmental studies; components of environment: atmosphere,hydrosphere, lithosphere, and biosphere
Scope and importance; Concept of sustainability and sustainable development; Brief history of environmentalism

Weeks 3—7
Definition and concept of Ecosystem: Structure of ecosystem (biotic and abiotic components);

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Syllabus of Ennvironmental Studies (EVS)

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Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession), and Biogeochemical (nutrient cycling) processes. Concepts of productivity, ecological pyramids and homeostasis

Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India
Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservationand conservation strategies; Basics of Ecosystem restoration

Weeks 8—11
Land cover, land use change, land degradation, soil erosion, and desertification; Causes of deforestation; Impacts of mining and dam building on environment, forests, biodiversity, and tribal communities Natural and man-made sources of water; Uses of water; Over exploitation of surfaceand ground water resources; Floods, droughts, and international & inter-state conflicts over water

Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues asa biomass energy source
Case studies: Contemporary Indian issues related to mining, dams, forests, energy, etc (e.g., National Solar Mission, Cauvery river water conflict, Sardar Sarovar dam, Chipko movement, Appiko movement,Tarun Bharat Sangh, etc).

Weeks 12-15
Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards
Related case studies

Nuclear hazards and human health risks; Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc; Waste segregation and disposal
Related case studies

6.4Weekly Lesson Plan

(Year 2)Weeks 1—4
Definition of Biodiversity; Levels of biological diversity; India as a mega-biodiversity nation;
Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCNRed list criteria and categories
Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and

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Syllabus of Ennvironmental Studies (EVS)

Ability Enhancement Course (AEC-I) for all undergraduate courses

informational values of biodiversity with examples; sacred groves and their importance with examples

Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis; Biodiversity conservation strategies: in-situ and ex-situ methods of conservation; National Parks,Wildlife Sanctuaries, and Biosphere reserves; Keystone, Flagship, Umbrella, and Indicator species; Species reintroduction and translocation

Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)

Weeks 5-9
Causes of Climate change, Global warming, Ozone layer depletion, and Acid rain; Impacts on human communities, biodiversity, global economy, and agriculture
International agreements and programmes: Earth Summit, UNFCCC, Montreal and Kyoto protocols,

(Continued)

Syllabus of Ennvironmental Studies (EVS)

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Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc.

Sustainable Development Goals: India's National Action Plan on Climate Change and its major missions Wildlife Protection Act, 1972; Water (Prevention and Control of Pollution) Act, 1974; Forest (Conservation) Act 1980; Air (Prevention & Control of Pollution) Act, 1981; Environment Protection Act, 1986; Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act,2006

Weeks 10—15
Human population growth: Impacts on environment, human health, and welfare; Carbon foot-print; Resettlement and rehabilitation of developmental project affected persons and communities; relevant case studies; Environmental movements: Chipko movement, Appiko movement, Silent valley movement, Bishnois of Rajasthan, Narmada Bachao Andolan, etc; Environmental justice: National Green Tribunal and its importance

Environmental philosophy: Environmental ethics; Role of various religions and cultural practices in environmental conservation
Environmental communication and public awareness: case studies (e.g., CNG vehicles in Delhi, Swachh Bharat Abhiyan, National Environment Awareness Campaign (NEAC), National Green Corps(NGC) "Eco-club" programme, etc)

7.0 Teaching Learning process
The teaching—learning methodologies are designed to provide the undergraduate students a comprehensive understanding of the subject in a simplistic manner as well as evoke critical reasoning and analytical thinking among them. The various approaches to teaching—learning process include classroom lectures, video presentations, and ICT enabled teaching tools. For enhancing practical understanding, field visits are encouraged to relevant places in Delhi like Biodiversity parks, Protected areas, Wetlands, Sewage treatment plants, etc.

7.1 Assessment methods

1. Written examinations (Semester exams) [(Year 1: 01 credit (1 hour); Year 2: 01 credit(1 hour)]
2. Project work and reports related to field visits, outreach activities, case study, projectformulation, assignments, presentations and practical learning (Internal practical assessment) [(Year 1: 01 credit (2 hour); Year 2: 01 credit (2 hour)]

Year 1 (Sem-I/Sem-II): 01 Credit Theory+ 01 Credit practical exercises, etc.
= Total 02 Credits (03 hours)
Year 2 (Sem-I/Sem-II): 01 Credit Theory+ 01 Credit practical exercises, etc.
= Total 02 Credits (03 hours)

B.Sc.(H) Zoology Semester V-ZH DSE Course I-Animal Behaviour and Chronobiology

Unit 3: Social and Sexual Behaviour 15 hrs

Social Behaviour: Concept of Society; Communication and the senses (Chemical, Tactile, Auditory, Visual); Altruism, Inclusive fitness, Hamilton's rule; Insects' society (Example: Honey bee); Foraging in honey bee and advantages of the waggle dance.

Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice), Courtship behaviour; Parental care, sexual conflict in parental care.

Unit 4: Introduction to Chronobiology 6 hrs

Historical developments in chronobiology; Biological oscillation: the concept of Average, amplitude, phase and period. Adaptive significance of biological clocks

Unit 5: Biological Rhythm 13 hrs

Characteristics of biological rhythms; Short- and Long-term rhythms; Circadian rhythms; Tidal rhythms and Lunar rhythms; Concept of synchronization and masking; Photic and non-photic zeitgebers; Circannual rhythms; Photoperiod and regulation of seasonal reproduction of vertebrates; Role of melatonin.

Unit 6: Biological Clocks 8 hrs

Relevance of biological clocks; Chronopharmacology, Chronomedicine, Chronotherapy.

Practical [Credits: 2]

1. To study nests and nesting behaviour of the birds and social insects.
2. To study the behavioural responses of wood lice to dry and humid conditions.
3. To study geotaxis behaviour in earthworm/ phototaxis behaviour in insect larvae.
4. Study of courtship behaviour in birds and insects from short videos/films.
5. Visit to Forest/Wild life Sanctuary/Biodiversity Park/Zoological Park to study and record the behavioural activities of animals and prepare a short report.
6. Study and actogram construction of locomotor activity of suitable animal models.
7. To study circadian functions in humans (daily eating, sleep and temperature patterns).

Teaching and Learning Process:

Teaching learning methods for the Animal behaviour and chronobiology paper should include conventional black board teaching coupled with power point presentations and smart board. The animal behaviour in wild life can be shown to the student with the help of videos and short films. The classroom teaching should be inclusive and have opportunities for the students to participate in the class discussion. The students should be encouraged to observe various live animal behaviours in their immediate surrounding environment and interpret them. There should be ample scope for field visits and visit to the research laboratories. Seminar should be arranged at the departmental level for the student, where student can have paper presentation on various themes of animal behaviour and chronobiology. Quizzes and debates can be arranged to make the teaching learning more innovative. Students should be advised to use e resources along with standard text books and reference books. They should take short project work and case study on the animal behaviour. They should relate various concepts in chronobiology taught in the classroom with their daily life. The students should be regularly assessed.

Life Sciences

class hours. The students are asked to submit their record notebooks to the teacher/s for checking.
Week 2: Unit I
Week 3: Unit II
Week 4: Unit II
Week 5: Unit III
Week 6: Unit III
Week 7: Field visit
Week 8: Unit IV
Week 9: Unit IV
Week 10: Mid semester Exam
Week 11: Mid Semester Break
Week 12: Unit IV
Week 13: Unit V
Week 14: Unit V
Week 15: Unit V

Assessment Methods

Theory: The students are continuously evaluated based on a class test and the presentation given by each student. The answer scripts of the test are returned to the students and the test paper is discussed at length. The question paper is suitably modified for such students.
Each student in a class is given a different topic to prepare a PowerPoint presentation. All the remaining students listen to the presentation of each student, and peer students are also encouraged to ask questions. Presentations by students improves their reasoning and communication skills. The presentations of students are evaluated by the teacher based on the content, effectiveness of the presentation, whether any new information has been added, and lastly on the answers given by students to the questions posed by the teacher.
The Internal Assessment has a break-up as 10 marks for the test, 10 marks for the presentation/ assignment and 5 marks for the attendance, and comprises 25 % of the total marks.
Practicals: For continuous evaluation two tests are conducted; one on the table work experiments for 10 marks, and the other on setups for 10 marks. The total marks obtained is scaled down to 10. Ten marks are allotted for record notebooks, and 5 marks for attendance. The Internal Assessment for practicals comprises 50 % of the total marks.

Assessment Task

Unit No	Course learning Outcome	Teaching and Learning Activity	Assessment Task
Unit I:	General account about the microbes used as biofertilizer – Rhizobium – isolation,identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.	Class room lectures and Practical demonstration, experiments	Hands on exercises, PPT, assignments, tests
Unit II:	*Azospirillum*: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms.Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.	Class room lectures and Practical demonstration, experiments	Hands on exercises, PPT, assignments, tests

Botany syllabus-III semester

Teaching Learning Process

The Class room teaching is integrated with practical classes, and field visit to impart a sound understanding of the course. The theory topics are covered in lectures with the help of blackboard teaching and PowerPoint presentations. When the entire syllabus is completed, a few lectures are devoted to discuss the previous years' question papers.

Every practical session begins with detailed instructions, followed by students conducting the experiment/s in the laboratory/college campus. When all the students have collected the data, the observations are discussed. Any deviation from the expected trend in results is explained. The students are encouraged to graphically represent the data and record the experiment during class hours. The students are asked to submit their record notebooks to the teacher/s for checking.

College teachers can also form a group andprepare e-contents for theory as well as for practicals.

Field visit is also be organised to familarise the students with local plant species, and to understand community pattern and processes.

Cont.

Monochlamydeae- Any 2 families
Monocotyledons- Any 2 families
2. Field visit (local)- Subject to grant funds from the University
3. Mounting of a properly dried and pressed specimen of any wild plant on herbarium sheet (to be submitted with the record book).

References

1. Singh, G. (2012). *Plant Systematics: Theory and Practice*, 3rd edition. Oxford and IBH Pvt. Ltd. New Delhi. Chapter 1 for unit 1, chapter 2 for unit 5, chapter 3 for unit 4, chapter 5 for unit 2, chapter 7 for unit 3, chapter 8 & 9 for unit 7 and 8, chapter 10 for unit 6.
2. Simpson, M.G. (2010). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A. chapter 1 for unit 1, chapter 2, 6 &7 for unit 8, chapter 14 for unit 3, chapter 15-18 for unit 2.
3. Stuessy, Tod F. (2009) Plant Taxonomy: The systematic evaluation of comparative data - 2nd edition. Columbia University Press Chapter 5, 6 for unit 1, chapter 19-21 for unit 3, chapter10-11 for unit 4, chapter 4&7 for unit 7, chapter 8 for unit 8.
4. Gupta R.2011 (Ed.) Plant Taxonomy: past, present, and future. New Delhi: The Energy and resources Institute (TERI). chapter 2, for unit 5, chapter 4 for unit 5, chapter 5 for unit 3,chapter 8 for unit 2, chapter 9 for unit7 and 8 ,chapter 11-15 for unit 3.

Additional Resources

5. Stace, C.A (1989) Plant Taxonomy and Biosystematics 2nd edition. Cambridge University Press, NY USA. Chapter 1 and 2 for unit 1, chapter 3 for unit 7, chapter 4 & 5 for unit 3, chapter 9 & 10 for unit 2.
6. Raven, F.H., Evert, R. F., Eichhorn, S.E. (1992). *Biology of Plants.* W.H. Freeman and Company. New York, NY. chapter 20 for unit 8, chapter 12 for unit 1, 2 7 & 8.
7. Walter S. Judd, et.al. 2015 Plant Systematics : A Phylogenetic Approach 4th Edition Sinauer Associates , Oxford University Press.USA .chapter 1 for unit 1, chapter 4 for unit 3, chapter 2 & 8 for unit 8, appendix 1 for unit 5, chapter 3 for unit 6.
8. http://www.mobot.org/MOBOT/research/APweb/. Unit 6 (for APG IV classification)

Teaching Learning Process

Field visits to the forested areas and on the spot Plant identification feature would be very helpful. Visual media should be made available. It is suggested that Botany Department, University of Delhi may be entrusted with preparation of good visual aids that would help students get a feel of the subject and they find the subject interesting. Even the college teachers can form a group and work out these possibilities of visual aids that would enhance teaching learning process.
Week 1: Unit I
Week 2: Unit II
Week 3: Unit II
Week 4: Unit Local Field visit
Week 5: Unit III

Geography 5th semester syllabus

11. Regional Planning and Development

Course Objectives:

1. To understand the concept of Region and Regional Planning.
2. To familiarize the students with Theories and Models for Regional Planning.
3. To develop understanding about concept of Development, Sustainable Development and different programmes and policies.

Learning Outcome:

After studying, students will be able to:

1. Conceptualize the Regional Planning and its theories.
2. Get the overview of Sustainable Regional Development.
3. Have sound knowledge to Sustainable Development Policies and Programmes.

Course Content:

1. Definition of Region, Evolution and Types of Regional planning: Formal, Functional, and Planning Regions and Regional Planning;
2. Choice of a Region for Planning: Regionalization of India for Planning (Agro Ecological Zones)
3. Theories and Models for Regional Planning: Growth Pole Model of Perroux; Myrdal, Hirschman, Rostow and Friedmann;
4. Sustainable Development: Concept of Development and Underdevelopment; Efficiency-Equity Debate: Definition, Components and Sustainability for

Cont.

Geography 6th Semester syllabus

13. Evolution of Geographical Thought

Course Objectives:

1.Understanding historical evolution of geographic thought
2.Detailed analysis of different paradigms in geography
3.Evaluating the contemporary trends in geographical studies

Learning Outcomes:

1. In depth understanding about the evolution of geographical thought
2. Detailed knowledge about the paradigms and debates in the geographical studies.
3. Understanding of recent traditions in geography

Cont.

14.Disaster Management based Project Work (Practical

Course Objectives:

1. Understanding the basic concepts of disaster management
2. Detailed analysis about the different types of disasters in India
3. Evaluating the various dimensions of disaster management through field works

Learning Outcomes:

1. In depth understanding about the various disasters in the country
2. It will provide thorough understanding about the human responses to the disasters
3. It will give an in-depth knowledge about the disasterscapes through fieldworks

Course Content:

1. Introduction to Disaster Management: Basic concepts; Disaster Management Cycle: components and stages; Community Based Disaster Management
2. Flood and Drought
3. Cyclone and Hailstorms
4. Earthquake and Volcanoes
5. Landslides
6. Human Induced Disasters: Fire Hazards, Chemical, Industrial accidents

(Practical Record: Project work to be based on any two of the above topics of their Choice. First should be field-based case study and second should be local / college-based.)