**Course Name: Forest Ecology, Biodiversity and Management**

**Number of credits: 4 ECTS**

**Period: Autumn semester**

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| Coordinator | **Dr. Aasif Ali Gatoo** |
| Credits | 4 (3+1) ECTS |
| Lecturers | **Dr. Aasif Ali Gatoo, Dr. Shah Murtaza Mushtaq, Dr. Akhlaq Amin Wani,** |
| Level | Postgraduate |
| Host institution | Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-K) |
| Course duration | 18 Weeks |

**Summary**

This is a 4 ECTS course which is provided as Optional course (Major) to Master of Science Forestry (Forest Resource Management) students. The course introduces the basics of forest ecology and biodiversity. It exposes the students to qualitative and quantitate analysis of forest ecosystems focused towards conservational concepts and global efforts towards conservation.

**Target student audiences**

Master of Science Forestry (Forest Resource Management) students

**Prerequisites**

The student must have basic understanding of plant ecology and biodiversity at undergraduate level.

**Aims and objectives**

This course would enable the students to understand the aspects related to forest ecosystem and its dynamics. As well it provides the knowledge on biodiversity conservation in natural forests and agro-ecosystems, policy issues, IPR, etc.

**General learning outcomes:**

On completion of this course, the students would:

* Gain a wider understanding of ecology and phyto-diversity of forest landscapes.
* The students will enhance abilities and skills for survey, exploration and sampling strategies in forests and other green areas.
* It will enable the students to explore conservation areas and factors affecting thereof and develop understanding regarding national and global efforts towards conservation.

**Overview of sessions and teaching methods**

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| **Unit** | **Syllabus** |
| **Unit 1:** | Introduction to forest ecology, forest population, forest community dynamics, forest  community structure and analysis, forest productivity on a global scale, ecology of  forest landscapes spatial heterogeneity; Hierarchy issues in ecology. Introduction to forest recreation: Trends in outdoor recreational use of wild land and natural areas with emphasis on state and federal parks and forests. Elements and characteristics of landscape ecology. |
| **Unit 2:** | Biodiversity-an overview; genetic, species and ecosystem diversity; determinants of  biodiversity. Higher plant diversity, species richness and endemism. Managing plant genetic resources: Basic science issues – genetic vulnerability and crop diversity, crop diversity-institutional responses, in situ conservation of genetic resources, the science of collecting genetic resources, the science of managing genetic. |
| **Unit 3:** | Complementary strategies for plant biodiversity conservation. In situ conservation of wild species in nature reserves, in situ conservation components, factors influencing conservation value, national plan for in situ conservation. In situ conservation of Forest and agro-biodiversity on-farm: importance of on-farm conservation initiatives, overview of the types of information necessary in the design of an on-farm conservation programme. |
| **Unit 4:** | Managing plant genetic resources: policy issues (exchange of genetic resources: quarantine, IPR; genetic resources: assessing economic value; conflicts over ownership, management and use; national and international treaties/ legislations: CBD, IT-PGRFA, GPA, PVP and FR Act, Biodiversity Act, etc.). International instruments concerning agro-biodiversity, Agenda 21, convention on biological diversity (CBD), FAO and global system of PGR, the International Treaty on Plant Genetic Resources for food and agriculture (ITPGR), Global Plan of Action, TRIPS agreement and IPR protection of life forms. |
| **Practical** | **Vegetation community studies**   * Study of forest community structure and its successional status; * Estimation of productivity of forest ecosystem; * preservation of specimen; * Methods of vegetation analysis, Measurement of biomass and productivity; * Quantification of litter production and decomposition;   **Field Trips and Visits to assess some ecological studies.**   * Trip to different regions of the state to study forest vegetation, Collection and * Visit to national parks, wildlife sanctuaries, botanical gardens and arboreta. |
| **Individual Assignment** | * Individual exercise on * Collection and preservation of specimens in specific forest areas and urban landscapes. * Exercise on phyto-diversity using biodiversity indices in the nearby forest/urban vegetation areas. |
| **Group Assignment** | * Group exercise on: * Preparation of digital herbaria. * Sample project on measurement of biomass and productivity in natural forests and urban landscapes.\ * Assessment of litter production and decomposition in different ecosystems. |
| **Self Study** | * Understanding the basic and modelling of geoinformatics on provided teaching materials and related literature. * Preparation/processing of geographical data to be used in class activities |

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| **Learning methods** | * In class lecture * Online tutorials * Lab/Field exercises * Project-Based Learning * Individual Assignments * Group Assignments * Presentations |

**Course outline**

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|  | **UNIT 1** |
| **Week1** | Introduction to forest ecology, forest population, |
| **Week2** | Forest community dynamics, forest  community structure and analysis, |
|  | **Practical:**   * Study of forest community structure and its successional status; |
| **Week3** | forest productivity on a global scale, ecology of  forest landscapes spatial heterogeneity; Hierarchy issues in ecology |
|  | Introduction to forest recreation: Trends in outdoor recreational use of wild land and natural areas with emphasis on state and federal parks and forests. |
| **Week4** | Elements and characteristics of landscape ecology. |
|  | **Practical:**   * Estimation of productivity of forest ecosystem; |
|  | **UNIT 2** |
| **Week5** | Biodiversity-an overview; genetic, species and ecosystem diversity; determinants of  biodiversity. |
|  | **Mid Term** |
| **Week6** | Higher plant diversity, species richness and endemism. |
| **Week7** | Managing plant genetic resources: Basic science issues – genetic vulnerability and crop diversity, crop diversity-institutional responses, |
|  | **Practical:**   * preservation of specimen; |
| **Week8** | in situ conservation of genetic resources, the science of collecting genetic resources, the science of managing genetic |
|  | **UNIT 3** |
| **Week9** | Complementary strategies for plant biodiversity conservation. In situ conservation  of wild species in nature reserves, |
|  | **Practical:**   * Methods of vegetation analysis, Measurement of biomass and productivity; |
| **Week10** | in situ conservation components, factors influencing conservation value, national plan for in situ conservation. |
| **Week11** | In situ conservation of Forest and agro-biodiversity on-farm: importance of on-farm conservation initiatives, |
| **Week12** | overview of the types of information necessary in the design of an on-farm conservation programme. |
|  | **UNIT 4** |
| **Week13** | Managing plant genetic resources: policy issues (exchange of genetic resources: quarantine, |
|  | **Practical:**   * Quantification of litter production and decomposition; |
| **Week14** | IPR; genetic resources: assessing economic value; conflicts over ownership, management and use; national and international treaties/ legislations:  CBD, IT-PGRFA, GPA, PVP and FR Act, Biodiversity Act, etc.). |
|  | **Practical:**   * Trip to different regions of the state to study forest vegetation, Collection. |
| **Week15** | International instruments concerning agro-biodiversity, Agenda 21, convention on biological diversity (CBD), FAO and global system of PGR. |
|  | **Practical:**   * Visit to national parks, wildlife sanctuaries, botanical gardens and arboreta. |
| **Week16** | the International Treaty on Plant Genetic Resources for food and agriculture (ITPGR), Global Plan of Action, |
| **Week17** | TRIPS agreement and IPR protection of life forms. |
| **Week18** | **Practical Exam/Assignment submission/Presentation** |
|  | **End Tem Exam** |

**Literature**

**Compulsory**

Avery TE and Burkharts H. 2001. Forest Measurements. McGraw-Hill Education.

Barnes BV, Zak DR, Denton SR and Spurrs SH. 1998. Forest Ecology. Wiley.

Jha BC, Pandey BN, Jaiswal K, Katiha PK, Pandey PN and Sharma AP. 2012. Biodiversity: Issues Threats and Conservation. Narendra Publishing House, Delhi.

Artmann M. Breuste J, Cristian Ioja C, Qureshi S. eds "Making Green Cities - Concepts, Challenges and Practice", Springer "Cities and Nature" Series, ISBN 978-3-030-37715-1.

**Recommended**

Kumar Biju. 2013. Biodiversity and Taxonomy. Narendra Publishing House, Delhi.

Larocque GR. 2016. Ecological Forest Management Handbook (Applied Ecology and Environmental Management). Taylor & Francis.

Mahato B, Pandy BN, Singh LB, Panday PN and Singh RK. 2010. Text Book of Environmental Pollution. Narendra Publishing House, Delhi.

Mikusiñski G, Roberge JM and Fuller R. 2018. Ecology and Conservation of Forest Birds (Ecology, Biodiversity and Conservation). Cambridge University Press.

Pandey PN. 2009. Biodiversity and Environment Ecology. Narendra Publishing House, Delhi.

Perry DA, Oren R and Hart SC. 2008. Forest Ecosystems. 2nd ed. Baltimore: Johns Hopkins University Press.

Young RA and Giese RL. 2003. Introduction to Forest Ecosystem Science and Management. Wiley.

Bonneuil, Christophe and Jean-Baptiste F. The Shock of the Anthropocene: The Earth, History and Us. London; Brooklyn, NY: Verso, 2016. (Chapter 1: Welcome to the Anthropocene).

Brush SB. 1999. Genes in the Field: On-farm Conservation of Crop Diversity. Lewis Publishers, Boca Raton, Florida, USA.

Chandna RC. 2002: Environmental Geography, Kalyani, Ludhiana.

Cunninghum WP and Cunninghum MA. 2004: Principles of Environmental Science: Inquiry and Applications, Tata Macgraw Hill, New Delhi.

Engels JMM. 1995. In Situ Conservation and Sustainable Use of Plant Genetic Resources For Food and Agriculture in Developing Countries. IPGRI/ DSE.

Jarvis D, Staphit B and Sears L. 2000. Conserving Agricultural Biodiversity in Situ: A Scientific Basis for Sustainable Agriculture. IPGRI, Rome, Italy.

Maxted N, Ford-Lloyd BV and Hawkes JG. 1997. Plant Genetic Conservation: The In Situ Approach. Chapman & Hall, London.

Wood D and Lenne J. 1999. Agrobiodiversity: Characterisation, Utilization and Management. CAB International, Wallingford.

ETH Zurich, Open Access models, <https://ites-fe.ethz.ch/openaccess/>.

**Course workload**

The table below summarizes course workload distribution:

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| --- | --- | --- | --- |
| **Activities** | **Learning outcomes** | **Assessment** | **Estimated workload (hours)** |
| **In-class activities (32 hours)** | | | |
| Lectures | Understanding theories, concepts, methodology and tools in Forest Ecology, Biodiversity and Management. | Class participation | 16 |
| Moderated in-class discussions | Understanding various policy and management contexts and common problems in communication in Forest Ecology, Biodiversity and Management. | Class participation and preparedness for discussions | 05 |
| Reading and discussion of assigned papers for seminars and preparation for lectures | Familiarity with and ability to critically and creatively discuss key concepts, tools and methods as presented in the literature | Class participation, creative and active contribution to the discussion | 05 |
| Group presentation | Ability to interpret data, to analyze the audience, and use the concepts, tools to understand Forest Ecology, Biodiversity and Management. | Quality of group assignments and individual presentations | 06 |
| **Practical (Lab and Field) (32 hours)** | | | |
| Practical | Ability to perform lab experiments and use field based equipment after demonstration of tools and procedures by the instructor. | Class/Field participation for data generation and preparedness for field project works | 32 |
| **Independent work (51 hours)** | | | |
| Self-Study | Familiarity with and ability to critically and creatively discuss key concepts, tools and methods as presented in the literature |  | 35 |
| Individual Assignment/Presentation | Ability to individually interpret data, analyze the audience, and use the concepts, and tools, to understand Forest Ecology, Biodiversity and Management. |  | 10 |
| Group Assignment/Presentation | Ability to interpret data, analyze the audience, and use the concepts, and tools, to understand Forest Ecology, Biodiversity and Management. | Quality of group assignments and individual presentations | 15 |
| ***Total*** |  |  | ***115 Hours*** |

**Grading**

The students’ performance will be based on the following:

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| **Mode of assessment** | **% of marks** |
| Quiz 1 | 5 |
| Mid Term (Objective and Written) | 20 |
| Practical/Assignments (Discussion) | 25 |
| Quiz 2 | 5 |
| End Term (Objective and Written) | 45 |
| **Total** | **100** |

**Evaluation**

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| **% secured** | **Grade** |
| <55% | Fail |
| 55% and Above | Pass |