

## GENERIC ELECTIVES (BOT-GE-5)

### Credit distribution, Eligibility and Pre-requisites of the Course

| Course title & Code  | Credits  | Credit distribution of the course |          |                     | Eligibility criteria | Pre-requisite of the course |
|--|----------|-----------------------------------|----------|---------------------|----------------------|-----------------------------|
|  |          | Lecture                           | Tutorial | Practical/ Practice |                      |                             |
| <b>Green Belt Development and Urban Management for Smart Cities</b><br><b>BOT-GE-5</b> | <b>4</b> | <b>2</b>                          | <b>0</b> | <b>2</b>            | -                    | Nil                         |

### Learning Objectives

The Learning Objectives of this course are as follows:

- To make students aware about Green Belt Development, which is a major step in the development of a sustainable ecosystem, particularly under the Smart Cities Program for urban development (Government of India).
- To introduce students with one of the key green skill development programs under the Skill India mission by the Government of India.
- To acquaint students with various methods and techniques used in development of green infrastructure for smart cities

### Learning outcomes

After completion of this course, students will:

- become familiar with green skills that contribute to preserving or restoring the environment for a sustainable future that protect ecosystems and biodiversity, reduce energy and minimize waste and pollution.
- understand the role of green belt in capturing the transient emissions, prevent soil erosion and degradation, containing water run-offs and recharging ground water, attenuate noise generated and improve the aesthetics.

- be well trained (knowledge & skills) to contribute to Green SectorSkill program.

## **SYLLABUS OF BOT-GE-5**

### **Unit 1: Introduction**

**Week: 01**

Definition, History and Concept of Green Belt; Aesthetics and Importance; Recommended Guidelines for green belt development for industries; Advantages and Applications.

### **Unit 2: Pollution and Carbon emission**

**Weeks: 02**

Type and various source of Emissions; Methods of estimation and monitoring of pollutants; Mechanism of deposition; Regulatory standards for major pollutants.

### **Unit 3: Plant-Pollutant Interaction**

**Weeks: 02**

Methods of sampling and screening local flora, Native and Exotic Plants, Various indicators (Morphological, Anatomical, Physiological and Biochemical) for selection of pollution mitigating plants; Sensitive/indicator, Resistant/ Tolerant Plant Speciesfor different pollutants (air, water, land and sound). Factors effecting plant regeneration and growth.

### **Unit 4: Structural and Functional Aspects of Green Belt**

**Weeks: 03**

Methods of Planting and Propagation, Various approaches for green belt development, Theoretical Models; Site specific ecological requirements, parameters involved that affect landscape design, Methods to evaluate the effectiveness of green belt. Various tools for assessment and monitoring of green belt (GIS and Remote Sensing)

### **Unit 5: Green Belt for Mitigating Climate change**

**Weeks: 02**

Objectives of UNFCCC for mitigating greenhouses gases in urban sectors, Green Finance and Green Infrastructure development, Methods to evaluate total carbon sequestered; Carbon stocks and credits.

### **Unit 6: Waste water treatment through constructed wetlands**

**Weeks:**

**03**

Introduction: Wetlands values and functions, natural and constructed wetlands for wastewater treatments; Life forms in wetlands: microbes and vegetation in wetlands, plants adapted to pollutants and flooding, Role of macrophytes in constructed wetlands; physical and chemical characteristics of freshwater wetlands, constructed wetlands: types, role and management including key parameters for assessment.

**Unit 7: Economics of Green Infrastructure**

**Weeks: 02**

Understanding of key plants for green economy - NFTP (Non-Forest timber products), biodiesel plants, herbal garden; Evaluating the cost and benefits of green belt development with type studies, Environmental accounting, Ecosystem services and constituents of wellbeing. Environmental Impact Assessment

**Practicals:**

1. Methods of Vegetation Sampling and calculation of importance value index. **(Weeks: 02)**
2. Measuring Tree Height and Cover to estimate green cover of an area. **(Weeks: 03)**
3. Estimation of total carbon of an area. **(Weeks: 02)**
4. Methods for selection of plants according to pollutant load in air and water (includes field survey) **(Weeks: 02)**
5. Open Sources Software for mapping the GPS points and generating a cover map. **(Weeks: 02)**
6. Measurement of Dissolved Oxygen (DO) from treated waste water. **(Weeks: 02)**
7. Measurement of BOD and TDS from intake and treated pond. **(Weeks: 02)**

**Essential/recommended readings:**

- Vesilind, P. A., Peirce, J. J., Weiner, R., (1998). Environmental Pollution and Control. Netherlands: Elsevier Science.

- Burnwal, K., Jagwani, D. (2013). Air Pollution Abatement through Trees & GreenBelt Development. LAP Lambert Academic Publishing.
- CPCB (2000). Guidelines for Green Belt development, CPCB, MoEF, Gol, NewDelhi.
- Zhou, S. W. W., Zhou, S. W. W. (2020). Carbon Management for a SustainableEnvironment. Germany: Springer International Publishing.
- Yunus, M., Singh, N. *de Kok*, L.J. (2013). Environmental Stress: Indication, Mitigation and Eco-conservation.Netherlands: Springer Netherlands
- Acar, S., Yeldan, A.E. (2019). Handbook of Green EconomicsNetherlands: Elsevier Science.
- Stefanakis, A., (2018). Constructed Wetlands for Industrial Wastewater TreatmentUnited Kingdom, Wiley.
- Kröpfelová, L., Vymazal, J., Kröpfelová, L., Vymazal, J. (2008). Wastewater Treatment in Constructed Wetlands with Horizontal Sub-Surface Flow. Czechia: Springer Netherlands.

**Suggestive readings:**

- Amati, M. (2016). Urban Green Belts in the Twenty-first Century (Urban Planning and Environment) 1st Edition. Routledge publishers

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**

### **Nomenclature of certificate/diploma/degrees:**

- ✓ After securing 44 credits (from semester I and II), by completing one year of study of the UG honours Programme with Botany as a single core discipline, if a student exits after following due procedure, he or she shall be awarded **Undergraduate Certificate in Botany**.
  
- ✓ After securing 88 credits (from semester I, II, III & IV), by completing two years of study of the UG honours Programme with Botany as a single core discipline, if a student exits after following due procedure, he or she shall be awarded **Diploma in Botany**.
  
- ✓ After securing 132 credits (from semester I to VI), by completing three years of study of the UG honours Programme with Botany as a single core discipline, if a student exits after following due procedure, he or she shall be awarded **Bachelor of Science (Honours) in Botany**.
  
- ✓ After securing 176 credits (from semester I to VIII), by completing four years of study of the UG honours Programme with Botany as a single core discipline and writes dissertation, the student shall be awarded **Bachelor of Science (Honours with Research) in Botany**.
  
- ✓ After securing 176 credits (from semester I to VIII), by completing four years of study of the UG honours Programme with Botany as a single core discipline and engages in Academic Project/Entrepreneurship, the student shall be awarded **Bachelor of Science (Honours with Academic Project/Entrepreneurship) in Botany**.