# COURSE CONTENTS
## B.Sc. (Ag) Third Year Even Semester

| S.No. | Course Title | Credit Hrs | Theory | | Practical | Total |
|---|---|---|---|---|---|---|
| | | | Ex. | Int. | | |
| **1.** | Farming System and Sustainable Agriculture | 2+1 | 35 | 15 | 25 | 75 |
| **2.** | Conservation and Management of soil and Water Resources | 2+1 | 35 | 15 | 25 | 75 |
| **3.** | Ornamental Horticulture | 2+1 | 35 | 15 | 25 | 75 |
| **4.** | Environmental Science | 2+1 | 35 | 15 | 25 | 75 |
| **5.** | Silviculture and Agro-forestry | 2+1 | 35 | 15 | 25 | 75 |
| **6.** | Seed Production and Processing Technology | 2+1 | 35 | 15 | 25 | 75 |
| **7.** | Practical Crops Production-II | 0+2 | 0 | 0 | 75 | 75 |
| **Total** | | **12+8=20** | **210** | **90** | **225** | **525** |

### Paper I. Farming System and Sustainable Agriculture

Definition and concepts of farming system. Historical developments in farming system. Farming systems in India based on cultivation system viz. shifting, regulated, semi-permanent and permanent cultivation on rain fed and irrigation lands with perennial crops; grazing systems, enterprise mix, graphical distribution, general characteristics including relevant case studies, weakness as well as development path of each system. Concepts, importance, need and indicators of sustainability. Ecological basis of sustainability/ resource management. A profit of Indian agriculture in terms of availability of natural resources and their carrying capacity, demographic compulsions, increasing fuel and fodder needs, problems of soil health, land degradation and conservation of natural resources including soil and water as part of sustainable resource management. Maintenance of the production base in irrigation agriculture. Modernization of agriculture and its relation with sustainability, natural resource centered versus commodity led production system, low versus excessive external input agriculture (LEIA v/s HELA), necessity and limits of using external inputs in LEIA with particular references to artificial fertilizers, pesticides, improved seeds, irrigation and mechanization and their implication on sustainability. Basic ecological principles of low external input sustainable agriculture (LEISA), securing favorable soil condition for solar radiation, water and air, exploiting complementary, synergies and combining genetic resources, exploiting animal –plant and animal-animal interaction, mixing crop, mixing livestock and integrating crops and livestock including aquaculture, exploiting indigenous plants and animal. Some promising LEISA techniques and practices – improved manure handling, composting, green manuring and bio-fertilizers, crop residue management and strategic use of mineral fertilizers. Mulching, wind

breaks, water harvesting, tied ridging, strip cropping, preamble contour line barriers and water ponds.

**Practical**

Inter cropping, trap and decoy crops, constructed traps, repellents, biological control and strategic used of pesticides in crop and natural medicines in animal health care. Bio –intensive gardening, control farming, integrated crop livestock-fish farming, integrated forage production and farmer-centered techniques and practices there of Evaluation of constraint and optimization of farming systems.

## Paper II. Conservation and Management of Soil and Water Resources

Soil resources of India; distribution of waste land problem soils; water resources of India and their utilization in crop production; soil tilth management and relationship with tillage; tilth requirement of different crops; soil impedance layers and their improvement; management of soil water energy state of water in soil and availability to plants; management of soil moisture under different climates; water harvesting techniques, effect of water quality on soil and plants; soil aeration problems and management ; soil thermal regimes in relation to crop and their optimization.

Recycling of agricultural and industrial organic wastes; wastelands and their management; reclamation and management of acidic, saline and sodic soils; soil erosion; extent, type and effects; soil conservation techniques, watershed mgt; application of remote sensing for assessment of soil and water resources.

**Practical**

Evaluation of irrigation water quality indices such as pH, ES RSC and SAR. Tensiometer and their use. Measurement of water holding and field capacities of soil. Preparation of saturation paste and saturation extracts of salt affected soils. Determination of pH, EC, Ca, Mg and Na in saturation extracts. Measurement of infiltration rate of soil, Determination of $CaCo_3$ equivalent of liming material. Estimation of lime requirement of acid soil and Gypsum requirement of sodic soils. Measurement of ODR and ER of soil. Estimation of water stable aggregate in soil and field trip to study the problems and management of soil and water resources.

## Paper III. Ornamental Horticulture

Importance of ornamental gardening in human life, theory and practice of lands and formal garden for various places, identification, use of ornamental plants for the beautification of private and public places, styles of garden; formal and informal etc., land scape and town planning,

ornamental plants for rural and urban areas, indoor gardening, pot culture; bonsai, hanging baskets etc. principles and practices involved in growing ornamental annul and perennial plants, planning, planning and layout of various parts of garden, herbaceous and shrubbery borders, lilly pots, rock gardens etc. Cultivation of important ornamental plants, rose, gladiolus, chrysanthemum, tuberose, orchids, anthodium, gerbera, dahlia, fern, palms, cycades, cacti etc. Post harvest technology, project formulation and evaluation.

**Practical**

Identification of ornamental plants, preparation, planting and care of lawn seed bed preparation and sowing, potting and repotting of ornamental plants, training and pruning of ornamental plants, cultural practices in important ornamental plants, bonsai culture, planning and layout of gardens, project formulation, use of flowers for different purpose, care and maintenance of green house/ poly house panes and arranging flower show, visit to nurseries and florist centers.

## Paper IV. Environment Science

### UNIT:-I (BASICS OF ENVIRONMENTAL SCIENCES)

**Introduction to Environmental Sciences**

- Definition, scope and importance (the multidisciplinary nature of environmental sciences)
- Need for public awareness on Environment, Role of individual in Environmental protection

**Natural resources (Renewable and Non-renewable Resources)**

- Natural resource conservation: concepts
- Freshwater resources: use and over-exploitation of surface and groundwater, conflicts over water, hydroelectric projects, problems, traditional methods of harvesting of freshwater resources.
- Mineral resources: use and exploitation, environmental effects of extracting mineral resources, lime stone quarrying in Uttaranchal.
- Food resources: World food problems, changes caused by agriculture and overgrazing, effect of modern agriculture, fertilizer operated problem, water logging, salinity.
- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
- Land resources: Land as a resources, land degradation, landslides, soil erosion and desertification.

**Ecosystems**

- Concepts, structure, and components of an ecosystem.
- Abiotic and biotic variables.

- Ecosystem function, trophic levels, energy flow, food chain, food web, Ecosystem, homeostasis.
- Examples of ecosystems(aquatic: pond, lake, river)
- Terrestrial ecosystem: Forest, mountain
- Ecological succession.

**Biodiversity and its conservation**

- Introduction: - Definition, genetic, species and ecosystem diversity.
- Bio- geographical classification of India
- Values of biodiversity: 5 Es (Esthetic, Economic, Environmental, Ethical, Emotional).
- Biodiversity at global, national and local levels.
- India as a mega-diversity nation, hot spots of biodiversity.
- Himalayan wildlife: Habitat loss poaching of wildlife, man-wildlife conflicts, and conservation.
- Threatened categories as per IUCN.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT-II (APPLIED ENVIRONMENTAL SCIENCES)**

**Environmental Pollution**

- Definition, causes, effects, and control measures of Air pollution.
- Water pollution and thermal pollution.
- Marine pollution.
- Noise and radioactive pollution.
- Solid waste and their management (municipal, industrial (hazardous and non-hazardous)), problems of solid waste Management (ISWM).
- Environmental hazardous in Himalayas (Floods, river, blockades, cloud burst, landslide, earthquakes)

**Environmental problems and Environmental Protection**

- Anthropogenic and natural environmental ethics: issues and possible solutions.
- Climate change, global warming: cause, effects and mitigation (national and international efforts)
- Ozone layer depletion: causes, effects and mitigation. (national and international)
- Environmental Protection Act 1986.
- Air (Prevention and Control of pollution) Act, Water (Prevention and control of Pollution) Act.
- Wildlife Protection Act 1972
- Forest Conservation Act 1980
- The Biological Diversity Act 2002

- Issues involved in enforcement of environmental legislation, public awareness, Article 48A and 51 A
- Automobile Emission standards (Eco/Bharat), Eco-mark.

**Human Population and the Environment**

- Population growth, variation among nations, population explosion family welfare programme.
- Environmental and human health.
- Role of Information Technology in environment and health.

**Sustainable Development**

- Definition, concepts and currencies.
- Sustainable development of agro-ecosystem (organic farming)
- Sericulture, floriculture, bee keeping.
- Sustainable development of hydro energy in Uttarakhand.
- Traditional Ecological knowledge. (TEK)

**Field Work/ Practical**

- Documentation of natural resources of local area (river, forest, lake, pond, mountain, grassland)
- Visit to local polluted sits-urban/rural/industrial/agricultural
- Study of common plants, birds and mammals
- Study of simple ecosystem (pond, river, lake, hill slopes, etc.)
- Visit to sanctuaries, national parks and biosphere reserves.

## Paper V. Silviculture and Agro-forestry

Introduction to basic terms, concepts and scope, national and global need, grouth and development of trees and forest stands growth and development stages and growth measurements, factors affecting tree and stand growth, plant succession kinds and causes, natural and artificial regeneration establishment and care of tree nurseries tending operation cleaning, weeding, thinning, pruning, and other cultural operation classification, regeneration and crop characteristics of major Sliviculture systems, basic concept of rotation, sustainable yield management and multiple use, establishment of forest stands/crops and agro-forestry selection and management of tree and crop species i.e. planting density, geometry and Silviculture, comparison among various land uses mixed farming, multiple cropping and agro-forestry, Interactions between components of agro-forests for various resources and productivity. Problems, choice and management of agro-forestry systems in various agro-climatic zones.

**Practical**

Identification and judging of tree species for their agro-forestry potentials, growth and development stages of forest trees and shrubs, qualification of growth (tree height, diameter, volume and increment) in trees, forest types natural regeneration, seed collection, storage and testing, planning forest nurseries site preparation and planting, computation of biological rotation in tree crop and tree crop interaction studies in agro-forestry.

## Paper VI. Seed Production and Processing Technology

Seed, its importance in green revolution difference between grain and seed, concept of seed quality, steps involved in seed production. Seed technology, its objectives and its role in increasing agriculture production. Seed industry in India. Development of seed programs, general principles of seed production. Seed replacement rate, multiplication rate, Breeder's foundation and certified seed, maintenance of genetic purity, Nucleus and breeders seed production of newly released and established varieties of self pollinated crops, viz; Rice, Wheat Soybean/chickpea, Pigeon pea, Rapeseed and mustard etc. Maintenance of nucleus and breeder's seed in cross of establish varieties, foundation and certified seed production of maize in breeds, single and double cross hybrids. Hybrid seed production of sunflower, Sorghum, pearl millet and Rice using male sterility systems. Latest released hybrids of Maize, Sorghum, Bajra and Rice their characteristics feature, seed production of Wheat, Rice, Oats, Soybean, Gram, Urd, Moong, Sunflower, Pigeon pea etc. Seed certification, its concepts, role and goals, seed certification agencies, certified and truthfully labeled seeds Seed processing, storage and marketing, minimum seed certification standards for self and cross-pollinated crops. Field and seed inspection objectives, general principle and methods, Seed sampling and seed testing for analytical purity, varietal identification through electrophoreses, Grow out test for cultivar purity, seed legislation and seed law enforcement including IPR, PBR in India, Recent developments in seed industry, Genetic ascent of varietal determination.

**Practical**

Seed production in major crops viz, Rice, Wheat, Soybean, Pulses, Oil, Seeds, Maize, Sunflower, Sorghum, Bajra and Forage crops, Seed testing approaches and techniques in cereals, pulses, oilseeds and other crops.

## Paper VII. Practical crops Production-II

Complete practical acquaintance relating to scientific production techniques of major field of the season crop(s) including sowing weeding, hoeing, fertilizer and manure application, harvesting etc.