



Central University of Himachal Pradesh

(ESTABLISHED UNDER CENTRAL UNIVERSITIES ACT 2009)

Dharamshala, Himachal Pradesh-176215



NAAC Criterion-I

Key Indicator –1.3.2

**Number of value added courses for
imparting transferable and life skills
during last five years**

1.3.2 Evidences



Department of Plant Science

Central University of Himachal Pradesh, Dharamshala,

Kangra



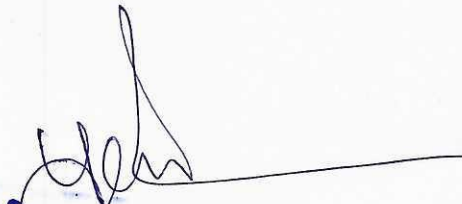
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Department of Plant Science

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विभागाध्यक्ष, पादप विज्ञान विभाग
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Central University of Himachal Pradesh, Dharamshala
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हिमाचल प्रदेश केंद्रीय विश्वविद्यालय Central University of Himachal Pradesh

(पादप विज्ञान विभाग / Department of Plant Science)

(जीव विज्ञान स्कूल / School of Life Sciences)

शाहपुर परिसर, जिला काँगड़ा, हिमाचल प्रदेश -176206




File No: Plant Science/2-3(Head File)/CUHP/21/490

Dated: 27/03/2023

1.3.2 List of value-added courses during the last five years

Semester	Course Code	Name of the Course	Year of offering (for Session)
1 st	BOT 424	Herbal and Medicinal Plants	2017-18
	BOT 427	Organic Farming and Practices	
2 nd	BOT 421	Plants and Society)	
	BOT 425	Plant Products in Human Healthcare	
Semester	Course Code	Name of the Course	Year of offering (for Session)
1 st	BOT 424	Herbal and Medicinal Plants	2018-19
	BOT 427	Organic Farming and Practices	
2 nd	BOT 421	Plants and Society	
	BOT 425	Plant Products in Human Healthcare	
Semester	Course Code	Name of the Course	Year of offering (for Session)
1 st	BOT 424	Herbal and Medicinal Plants	2019-20
	BOT 427	Organic Farming and Practices	
2 nd	BOT 421	Plants and Society	
	BOT 425	Plant Products in Human Healthcare	
Semester	Course Code	Name of the Course	Year of offering (for Session)
1 st	PLS 407	Commercial Horticultural Crops	2020-21
	PLS 408	Mushroom Production	
2 nd	PLS 457	Plant & Society	
	PLS 458	Plant Products in Human Healthcare	
Semester	Course Code	Name of the Course	Year of offering (for Session)
1 st	PLS 422	Protected Cultivation of High Value Crops	

	PLS 423	Biosafety, IPR and Patenting Issues in Plant Sciences	2021-22
	PLS 424	Gardening and Landscaping	
	PLS 425	Commercial Horticulture Crops	
2 nd	PLS 471	Community Development	
	PLS 472	Methods of Vegetation mapping	
	PLS 473	Fundamentals of Seed Technology	


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COUSRE CONTENT OR SYLLABUS

Course Code: BOT 424

Credit: 02

Course Name: Herbal and Medicinal Plants

Course Outcome:

After the completion of the course the students will be able to

1. Students will be able to understand role of bioactive molecule in herbal drug.
2. After completion of course student is able to know how herbal plant are used for particular disease
3. To know about various economically important plants and their products commonly utilized for basic human needs as food, clothing, shelter, health etc.

Course Contents:

- International Code of Botanic Nomenclature (ICN): principles of priority, typification, effective and valid publications; voucher specimens in plant systematics, herbarium vouchers and herbariums,
- Biodiversity acts, Different methods of conservation of medicinal plants and biodiversity
- Botanicals and categories of botanical therapeutics
- Herbs as raw materials, definition of herb, herbal medicines, herbal medicinal product and herbal drug preparations
- A brief account of the origin, history, botany, cultivation, processing chemical composition and uses of the following beverages crops. (i) Tea (ii) Coffee
- A brief account of the origin, history, botany, cultivation, processing and uses of Tobacco and Para rubber.
- *Medicinal and Aromatic Plants: Aconitum, Digitalis, Glycyrrhiza, Rauvolfia, Neem, Tulsi, Assafoetida, Ginseng, Mentha, Rosa, Jasminum, Withania somnifera, Opium, Tulsi, Bael, Aconitum napellus, Colchicum, Exogonium, Belladonna, Cinchona, Calotropis*

Suggested Reading

- Kochhar S. L., 5th Edition (2016) Economic Botany: A Comprehensive Study Cambridge University Press.
- Pandey.B.P., 17th edition (2017) Economic Botany. Pandey, S. Chand Publication.
- Singh, Pande, Jain (2015) A Text Book of Botany, Rastogi Publications.

- Verma. V (2009) – Economic Botany, ANE Books.

Course Code: BOT 427

Credit: 02

Course Name: Organic Farming and Practices

Course outcome: By successfully completing the course, students will be able to:

1. The knowledge and proficiency in Organic Farming Practices, (both Basic and Social Aspects) marketing of organically raised agricultural produces
2. Gain the theoretical knowledge of cultivation of different types of edible mushrooms and spawn production
3. Learn a means of self-employment and income generation

Course Contents:

UNIT I

Introduction, definition, concept, importance, advantages and Disadvantages, objectives, essential characteristics of Organic farming, Principles, scope and components of organic farming, Organic Farming Products-Marketing, Theory and Practical Aspects.

UNIT II

Types of Farming (Advantage & disadvantage of each system)

Pure Organic Farming – Definition, Concept & Benefits; Integrated Farming system (Combination of Organic and Inorganic); Mixed Farming.

UNIT III

Various Organic Farming Models-Natural Farming, Fukuoka-Japan, Parma Culture, Billmollyson, Australian Organic Farming, Ecological Farming, Palekar Model; From Punam Farming to Green Revolution; Combined Farming-Paddy, Coconut Tree, Fish, Duck etc. Harvest and Post-harvest Management under Organic Farming;

UNIT IV

Integrated Pest Management, Weed control, Soil Nutrient Management, and irrigation management under Organic Farming. Undertake Quality Assurance & Certification in Organic Farming; understand different types of certification available for organic produce; Third party certification & Participatory guarantee systems

References

1. Sarath Chandran, Unni M.R and Sabu Thomas. 2018. Organic farming. Woodhead Publishing, UK.
2. Reddy, S.R.2017. Principles of organic farming. Kalyani publishers, India
3. Ranjan Kumar Biswas. 2014. Organic farming in India. New Delhi Publishers, India.
4. Peter Fossil. 2014. Organic Farming: How to Raise, Certify, and Market Organic Crops and Livestock. Reprint edition, Voyageur Press, USA.

Course Code: BOT 421

Credit: 02

Course Name: Plant and Society

Course Outcome:

After the completion of the course the students will be able to

1. Students will be able to understand the active mechanism of medicinal and aromatic plants.
2. Students will be able to learn about the uses of medicinal plants and other non-wood forest products.
3. Forest product would be commercial for household and industries.
4. Students will be able to learn about products commonly utilized for basic human needs as food, clothing, shelter, health etc.

Course Contents:

UNIT-I

Plant Biology: Botanical aspects, Plant tissue types (structure and function), Structural organization of flower, Double fertilization, Transport of nutrients in plants (active and passive transport)

UNIT -II

Plant adaptations, Pollination: Seed structure and dispersal mechanism, Plant Ecology: Biomes, Tundra, Grasslands, Deciduous and Tropical forests, Scrub, Desert, Different approaches for conservation of the plant diversity and sustainable development

UNIT-III

Cultivated plants as a source of food: General description about cereals (wheat, Maize and Rice), Legumes (Gram and Soybean), Oils and Fats (Groundnut), Spices (Black pepper and Cloves), Fibre Yielding Plant (Cotton), genetically modified plants (transgenic, cisgenic, subgenic)

UNIT-IV

Commercial/Medicinal aspects of plants: Stimulating Beverages (Tea and coffee), Paper, Cloth and Wood, Ornamental plants, Medicinal Plants, Psychoactive Plants, Toxic Plants

Suggested Readings

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
2. Introductory Botany: Plants, People, and the Environment by Linda Berg, 2nd Edition, Cengage Learning Publisher, 2007
3. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
4. Levetin, E., and McMahon, K. *Plants and Society*. 7th edition, New York, NY: McGraw-Hill, 2016

Course Code: BOT 425

Credit: 02

Course Name: Plant Products in Human Health care

Course Outcome:

After the completion of the course the students will be able to

1. Students will be able to learn about products commonly utilized for basic human needs as food, and human health.
2. The course aims to introduce the specific roles of biochemical, and molecular targets to identify and used in drug discovery.
3. Students would have an understanding of the treasure, value and usefulness of the natural plant products and their efficient use by the local communities as food and medicine and their conservation practices.
4. Entrepreneurship in the field of medicine and food industries.

Course Contents:

Unit I

Drugs (NCEs) mostly single active ingredient pharmaceuticals Vincristine and Vinblastine, Taxol, Camptothecin, Podophyllotoxin, Reserpine, Quinine, and Atropine originating from plants, Botanicals in cancer chemoprevention, standardized phytochemicals, and dietary supplements.

Unit II

Nutraceuticals, Functional food, and Functional beverage, Molecular Pharming advantage, and disadvantage, List of various Himalayan medicinal, aromatic and essential oil plants used in the traditional health care system, Value addition in Fruits and Vegetable Production.

Unit III

Pro-oxidants, Antioxidants, Bioactive antioxidant compounds like Uric acid, Vitamin C & E, Glutathione etc, Oxidative challenge in biology, Mechanism of action of antioxidants by Enzymes systems and Regulation of Nrf-2 factor, lipid peroxidation.

Unit IV

Role of a chemopreventive molecule like Capsaicin, Skin photoprotection by natural polyphenols, anti-inflammatory, and DNA repair mechanism, multi-targeted prevention and therapy of cancer by proanthocyanidins, anticancer properties of dietary polyphenols.

Suggested Reading

1. W.C.Evans & Trease, Pharmacognosy, 15th edn.2008, W.B. Saunders & Co.Ltd., London.
 2. Quality Control Methods for Medicinal Plant material, 1992, WHO Guidelines.
 3. Dr.P.Mukherjee, Quality control herbal drugs, 2005, Business Horizons, New Delhi
 4. CSIR- Cultivation and Utilization of Medicinal Plants.
 5. Handa S.S. & Kaul. K.L. Supplement to cultivation & utilization of
 6. Indian pharmacopoea, Indian Herbal Pharmacopoea and other pharmacopoeia.
-

Course Code: PLS 407

Credit: 02

Course Name: Commercial Horticultural Crops

Course outcome:

By successfully completing the course, students will be able to gain knowledge about Commercial Horticultural Crops.

1. This knowledge is central to our ability to modify plant responses and properties for global food security and commercial gains in biotechnology and agriculture.
2. Entrepreneurship in the field of agriculture and food industries.
3. Gain the theoretical knowledge of cultivation of different types of horticultural crops.

Course Contents:

UNIT I

National and International scenario in fruit production and floriculture, Recent advances in propagation – root stock influence, planting systems, High density planting, crop modeling, Precision farming, decision support systems - aspects of crop regulation- physical and chemical regulation effects on physiology and development, influence of stress factors, strategies to overcome stress effects, integrated and modern approaches in water and nutrient management. Total quality management (TQM) - Current topics.

UNIT II

Fruit Crops ; Mango, Papaya, Citrus, Guava, Apple, Plums, Peach

UNIT III

Specific objectives of breeding in flower crops, Methods of breeding suited to seed and vegetatively propagated flower crops, Introduction, selection, polyploidy and mutation breeding in the evolution of new varieties, Exploitation of heterosis, utilization of male sterility incompatibility problems, In Vtro breeding.

UNIT IV

Floral oil industry, floral concrete production, extraction methods, recent advances. Flower forcing and year-round flowering through physiological interventions; Chemical regulation; Environmental manipulation; Harvest indices; Harvesting techniques; Post-harvest handling; Precooling, pulsing, packing, marketing; Export potential; Agri Export Zones.

UNIT V

Crop specific practices – rose, anthurium, orchids, carnation, Jasminum sp., marigold, tuberose, crossandra

References

1. Bose TK, Maiti RG, Dhua RS & Das P. 1999. Floriculture and Landscaping. Naya Prokash.
2. Chadha KL & Choudhury B. 1992. Ornamental Horticulture in India. ICAR.
3. George S & Peter KV. 2008. Plants in a Garden. New India Publ. Agency.
4. Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices. Agrobios.
5. Randhawa GS & Mukhopadhyay A. 1986. Floriculture in India. Allied Publ.
6. Reddy S, Janakiram B, Balaji T, Kulkarni. S & Misra RL. 2007. Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.

Course Code: PLS 408

Credit: 02

Course Name: Mushroom Production

Course outcome: By successfully completing the course, students will be able to:

1. Identify edible types of mushroom
2. Gain the theoretical knowledge of cultivation of different types of edible mushrooms and spawn production
3. Manage the diseases and pests of mushrooms
4. Learn a means of self-employment and income generation

Course Contents:

UNIT I

Introduction, history and Scope of mushroom cultivation; Systematic details and biology of mushrooms; Nutritional value and medicinal value of mushrooms; Poisonous and edible mushrooms; Examples for poisonous and edible mushrooms; common edible mushrooms in India.

UNIT II

Structure and construction of mushroom house. equipments and substrates in mushroom cultivation; Spawn: types of spawn, preparation of spawn; Composting technology, mushroom bed preparation; harvesting. Casing; raw material used for casing, preparation of casing material; important sanitation during various stages of mushroom cultivation

UNIT III

Cultivation of important mushrooms: General process for the cultivation of *Agaricus bisporus*, *Pleurotus ostreatus* and *Volvariella volvaceae*

UNIT IV

Problems in cultivation - diseases, pests and nematodes, weed moulds and their management strategies.

UNIT V

Post-harvest technology; Preservation of mushrooms – Long term and short term storage of mushrooms - freezing, dry freezing, drying, canning, quality assurance and entrepreneurship. Value added products of mushrooms; Marketing of mushrooms in India and world.

References

1. Marimuthu, T. et al. (1991). Oyster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
2. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
3. Pandey R.K, S. K Ghosh, 1996. A Hand Book on Mushroom Cultivation. Emkey Publications.
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
6. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. PVT.LTD, New Delhi.

7. V.N. Pathak, Nagendra Yadav and Maneesha Gaur, Mushroom Production and Processing Technology/ Vedams Ebooks Pvt Ltd., New Delhi (2000).

Course Code: PLS 457

Credit: 02

Course Name: Plant and Society

Course outcome: After the completion of the course the students will be able to

1. Students will be able to understand the active mechanism of medicinal and aromatic plants.
2. Students will be able to learn about the uses of medicinal plants and other non-wood forest products.
3. Forest product would be commercial for household and industries.
4. Students will be able to learn about products commonly utilized for basic human needs as food, clothing, shelter, health etc.

Course Contents:

UNIT-1

Plant Biology: Botanical aspects, Plant tissue types (structure and function), Structural organization of flower, Double fertilization, Transport of nutrients in plants (active and passive transport)

UNIT -2

Plant adaptations, Pollination: Seed structure and dispersal mechanism, Plant Ecology: Biomes, Tundra, Grasslands, Deciduous and Tropical forests, Scrub, Desert,

UNIT-3

Different approaches for conservation of the plant diversity and sustainable development
Cultivated plants as a source of food: General description about cereals (wheat, Maize and Rice), Legumes (Gram and Soybean),

UNIT-4

Oils and Fats (Groundnut), Spices (Black pepper and Cloves), Fibre Yielding Plant (Cotton), genetically modified plants (transgenic, cisgenic, subgenetic)

UNIT-5

Commercial/Medicinal aspects of plants: Stimulating Beverages (Tea and coffee), Paper, Cloth and Wood, Ornamental plants, Medicinal Plants, Psychoactive Plants, Toxic Plants

References

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
2. Introductory Botany: Plants, People, and the Environment by Linda Berg, 2nd Edition, Cengage Learning Publisher, 2007

3. Kochhar, S.L. (2011). *Economic Botany in the Tropics*, MacMillan Publishers India Ltd., New Delhi. 4th edition.
4. Levetin, E., and McMahon, K. *Plants and Society*. 7th edition, New York, NY: McGraw-Hill, 2016
5. *Botany: An Introduction to Plant Biology* by Mauseth James D. (Jones & Bartlett Publishers, 2014)

Course Code: PLS 458

Credit: 02

Course Name: Plant Products in Human Health care

Course Outcome:

After the completion of the course the students will be able to

1. Students will be able to learn about products commonly utilized for basic human needs as food, and human health.
2. The course aims to introduce the specific roles of biochemical, and molecular targets to identify and used in drug discovery.
3. Students would have an understanding of the treasure, value and usefulness of the natural plant products and their efficient use by the local communities as food and medicine and their conservation practices.
4. Entrepreneurship in the field of medicine and food industries.

Course Contents:

UNIT-1

Drugs (NCEs) mostly single active ingredient pharmaceuticals Vincristine and Vinblastine, Taxol, Camptothecin, originating from plants, Botanicals in cancer chemoprevention, standardized phytochemicals, and dietary supplements.

UNIT-2

Nutraceuticals, Functional food, and Functional beverage, Molecular Pharming advantage, and disadvantage, List of various Himalayan medicinal, aromatic and essential oil plants used in the traditional health care system, Value addition in Fruits and Vegetable Production.

UNIT-3

Pro-oxidants, Antioxidants, Bioactive antioxidant compounds like Uric acid, Vitamin C & E, Glutathione etc, Oxidative challenge in biology, Mechanism of action of antioxidants by Enzymes systems and Regulation of Nrf-2 factor.

UNIT-4

Lipid peroxidation, Role of a chemo preventive molecule like Capsaicin, Skin photoprotection by natural polyphenols, anti-inflammatory

UNIT-5

DNA repair mechanism, multi-targeted prevention and therapy of cancer by proanthocyanins, anticancer properties of dietary polyphenols.

References

1. W.C.Evans & Trease, Pharmacognosy, 15th edn.2008, W.B. Saunders & Co.Ltd., London.
 2. Quality Control Methods for Medicinal Plant material, 1992, WHO Guidelines.
 3. Dr.P.Mukherjee, Quality control herbal drugs, 2005, Business Horizons, New Delhi
 4. CSIR- Cultivation and Utilization of Medicinal Plants.
 5. Handa S.S. & Kaul. K.L. Supplement to cultivation & utilization of
 6. Indian pharmacopoeia, Indian Herbal Pharmacopoeia and another pharmacopoeia
-

Course Code: PLS 422

Credit: 02

Course Name: Protected cultivation of High Value Crops

Course Outcome: After the end of the course, the student will be able:

1. To gain theoretical knowledge on protected cultivation and its implications
2. To understand the latest knowledge for growing of high value crops under protected environmental condition.

Course Contents:

UNIT-1

Importance and scope of protected cultivation of vegetable crops; principles used in protected cultivation, energy management, low cost structures; training methods; engineering aspects.

UNIT-2

Protected Cultivation – Greenhouse –Polyhouses- Plastic Tunnel – Shadenet House – Walk in Tunnels – Plant Protection Nets – Surface Cover Cultivation – Plastic Mulching – Soil Solarisation, Manipulation of CO₂, light and temperature for vegetable production, fertigation.

UNIT-3

Water Resource Management in protected cultivation – Farm Pond & Reservoir lined with Plastic Films

UNIT-4

Problem of growing vegetables in protected structures and their remedies, insect and disease management in protected structures; soil-less culture, use of protected structures for seed production.

UNIT-5

Crops covered under Greenhouse- Cabbage, Cucumber, Tomato, Capsicum; Crops under shadenet house - Ridge gourd, Bottle gourd, Cucumber, Capsicum, Broccoli, Okra, Chilli Vermi Bed – Organic Farming, BIS Standards - Protected Cultivation; MIDH – Path Forward

References

1. Anonymous 2003.Proc. All India Seminar on Potential and Prospects for Protective Cultivation. Organised by Institute of Engineers,Ahmednagar. Dec.12-13, 2003.
2. Chandra S &SomV. 2000. Cultivating Vegetables in Green House. IndianHorticulture 45: 17-18.
3. Prasad S & Kumar U. 2005.Greenhouse Management for HorticulturalCrops.2nd Ed. Agrobios.
4. Tiwari GN. 2003. Green House Technology for Controlled Environment. Narosa Publ. House.

Course Code: PLS 423

Credit: 02

Course Name: Biosafety, IPR and Patenting Issues in Plant Sciences

Course Outcome: After the end of the course, the student will be able:

1. To understand the various forms of intellectual property rights and its different forms, like Trade secrets, Trademarks, Copyrights, IPR and plant genetic recourses.
2. To understand the biohazards, biosafety levels and what are ethics issues in genetic engineering.
3. To understand a specialized knowledge and how to file patent, which material is subjected to patent and its infringements.

Course Contents:

UNIT-1

Introduction to Biological Safety Cabinets, Primary Containment for Biohazards, Biosafety Levels, Convention on biological diversity, Cartagena Protocol and Nagoya Protocol, Roles of Institutional Biosafety Committee, RCGM, GEAC etc. Definition of GMOs & LMOs, Environmental release of GMOs

UNIT-2

General Introduction to Intellectual Property Rights, Types of IP, Patents, Trademarks, Copyright, Related Rights, Industrial Design, Geographical Indications, Importance of IPR – patentable and non patentables, Patenting of biological materials, patenting life,

UNIT-3

Legal protection of Biotechnological inventions, Indian scenario of patents for higher animal and higher plants, Patenting of transgenic organisms and isolated genes, GURT, GATT, TRIPS, WTO agreement, Special issues in Biotechnology Patents, Patent Litigation.

UNIT-4

Recent Development in Patent System and Patentability of Biotechnology invention, Budapest treaty Development of patent system in India, Basic requirements of patentability, patentable subject matter, novelty and the Public Domain, Non obviousness compulsory licensing

UNIT-5

Patent infringements and revocation, Implications of intellectual property rights on the commercialization of biotechnology products, Indian Patent Act 1970 & recent amendments.

References:

1. Elements of Biotechnology, Gupta PK, Rastogi Publications, Meerut.
2. Intellectual Property rights in the WTO and Developing countries, Watal J, Oxford Univ Press.
3. Intellectual Property Bulletin, New Delhi
4. Biosafety and Bioethics: Joshi

Course Code: PLS 424**Credit: 02****Course Name: Gardening and Landscaping****Course Outcome:** After the completion of this course the learner will be able:

1. To apply the basic principles and components of gardening
2. To design various types of gardens according to the culture and art of bonsai
3. To establish and maintain special types of gardens for outdoor and indoor landscaping
4. To start Gardening and landscaping activity as an agri- business enterprise by liaising with different stake holders

Course Contents:**UNIT-1**

Scope and introduction to gardening, Gardening components and features, Special types of Gardens: Home garden, roof garden, sunken garden, vertical garden, terrace garden, water garden, rock garden, bottle garden, window garden, Suitable plants for different types of garden, Advantages and limitations in establishing different types of gardens,

UNIT-2

Detailed description of potted plants such as outdoor, foliage, flowers, creepers, climbers etc, Culture of Bonsai and its maintenance (pruning and wiring), Establishment and maintenance of lawn, Types of lawn, Machineries required for mowing a lawn, Establishment of topiaries and its maintenance

UNIT-3

Importance, features and maintenance of commercial gardening , Components such as statues, garden benches, paths, floral clock etc, Annuals, perennials and flowering trees for commercial / ornamental gardening, Designing of hedges

UNIT-4

Landscape designs (Components and Features), Urban landscaping, Landscaping in various places and its value addition. Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, dam sites, river banks, IT parks, corporate.

UNIT-5

Bioaesthetic planning, ecotourism, theme parks, indoor gardening, therapeutic gardening, Non-plant components (water scaping, xeriscaping, hardscaping); Computer Aided Designing (CAD) for outdoor and indoor scaping

References

1. Berry, F. and Kress, J. (1991). *Heliconia: An Identification Guide*. Smithsonian Books.
2. Russell, T. (2012). *Nature Guide: Trees: The world in your hands (Nature Guides)*.
3. Sabina, GT and Peter KV. 2008. *Ornamental Plants for Gardens*. New India Publ. Agency
4. Bose, T. K and Mukherjee, D. 1977. *Gardening in India*. Oxford & IBH Publishing Co. Pvt. Ltd., Calcutta
5. Bose, T. K. Malti, R. G. Dhua, R. S and Das, P. 2004. *Floriculture and Landscaping*. Nayaprakash, Calcutta
6. Nambisan, K. M. P. 1992. *Design Elements of Land Scape Gardening* Oxford & IBH Publishing Co. Pvt. Ltd., New Delh

Course Code: PLS 425

Credit: 02

Course Name: Commercial Horticulture Crops

Course Outcome: On the completion of the course, the students will be able:

1. To understand the different classifications of horticultural crops, nursery management, and use of technology in horticulture.
2. To develop their competency on pre and post-harvest technology in horticultural crops
3. To evaluate the importance of floriculture and contribution spices and condiments on economy

Course Contents:

UNIT-1

National and International scenario in fruit production and floriculture, Recent advances in propagation – root stock influence, planting systems, High density planting, crop modeling, Precision farming, decision support systems - aspects of crop regulation- physical and chemical regulation effects on physiology and development, influence of stress factors, strategies to overcome stress effects, integrated and modern approaches in water and nutrient management. Total quality management (TQM) - Current topics.

UNIT-2

Fruit Crops: Mango, Papaya, Citrus, Guava, Apple, Plums, Peach

UNIT-3

Specific objectives of breeding in flower crops, Methods of breeding suited to seed and vegetatively propagated flower crops, Introduction, selection, polyploidy and mutation breeding in the evolution of new varieties, Exploitation of heterosis, utilization of male sterility incompatibility problems, *In Vitro* breeding.

UNIT-4

Floral oil industry, floral concrete production, extraction methods, recent advances. Flower forcing and year-round flowering through physiological interventions; Chemical regulation; Environmental manipulation; Harvest indices; Harvesting techniques; Post-harvest handling; Precooling, pulsing, packing, marketing; Export potential; Agri Export Zones.

UNIT-5

Crop specific practices – rose, anthurium, orchids, carnation, Jasminum sp., marigold, tuberose, crossandra

Reference Books:

1. Bose TK, Maiti RG, Dhua RS & Das P. 1999. Floriculture and Landscaping. Naya Prokash.
2. Chadha KL & Choudhury B. 1992. Ornamental Horticulture in India. ICAR.
3. George S & Peter KV. 2008. Plants in a Garden. New India Publ. Agency.
4. Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices. Agrobios.
5. Randhawa GS & Mukhopadhyay A. 1986. Floriculture in India. Allied Publ.
6. Reddy S, Janakiram B, Balaji T, Kulkarni. S & Misra RL. 2007. Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.

Course Name: Community Development

Course Code: PLS 471

Credits = 02

Learning outcomes:

On the completion of the course, the students will be able:

- To understand characteristics of plants at community, population and ecosystem levels.
- To have sound background of ecosystem structure and function.
- To use various tools and techniques for ecological studies
- To understand the source of the environmental pollution and how to control the pollution in a sustainable way

Under this course, projects will be given to students to study the concepts in plant sciences with practical approach such as

1. Study of agricultural crop pattern around the villages near to University campus
2. Survey of biodiversity of villages
3. Agricultural weeds
4. Survey and documentation of medicinal Ayurveda practitioners in the surrounding areas to discuss the traditional medicines being used since ages
5. Community Based Natural Resource Management
6. Field trips: Field visit to gardens, standing crop sites, nurseries, vegetable gardens and horticultural fields at agricultural institutes / universities or other suitable locations to aware the students about the natural vegetation, Preparation of Field Notes
7. Plant sample collection, Preparation of Herbarium sheets and preservation. Purpose and importance of herbaria.
8. Attempt be made to grow the ethnobotanical plants
9. Workshops : Creative Writing and Entrepreneurship in plant science (Botany) (Soft skill)

Course Name: Methods for Vegetation Mapping

Course Code: PLS 472

Credits = 02

Learning outcomes:

After completing this course, the student will be able:

- To evaluate vegetation dynamics, variations, mapping and distribution of vegetation.
- To analyse data reviews, sampling approach and management using modern tools

UNIT-1

Nature of Vegetation, Community vs. Continuum, Vegetation Structure and Parameters (occurrence of species, Frequency, Cover), Different methods for field sampling - Quadrat, linetranssect and random spot method

UNIT-2

Vegetation Dynamics (Seasonal Variations and Succession) and its spatial distribution, various approaches for sampling (Stratified Random Sampling, Ecological gradients, Sampling scale issue and Gradient Oriented Transect (Gradsect) Sampling)

UNIT-3

Relationships between Classification and Mapping, Characteristics of a Successful Sampling Approach (Flexibility, Replicability, Cost Effectiveness)

UNIT-4

Overview of Planning Process and Field Methods: Preliminary Collection and Review of Existing Information, Initial Site Visit and Information Gathering, Review of data

UNIT-5

Sampling Approach, Collection of Field Data, GIS and GPS, Remote Sensing, Management and Analysis and Photo interpretation

Reference Books:

1. Causton, D.R.(1988). An Introduction to Vegetational Analysis: Principles, Practice and Interpretation. Unwin Hyman, Boston.
2. Percy, R.W., Mooney, H.A., Rundel, P.W. (2011). Plant Physiological Ecology: Field methods and instrumentation. Springer.
3. Ferretti, M., Fischer, R. (2013). Forest Monitoring: Methods for Territorial investigations in Europe with an overview of North America and Asia. Elsevier.
4. Brocklehurst, P., Lewis, D., Napier, D., Lynch, D. (2007) Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping. Technical Report No. 02/2007D. Department of Natural Resources, Environment and the Arts, Palmerston, Northern Territory.
5. William G. Cochran (2012) Sampling Techniques, 3ed, Wiley

Course Name: Fundamentals of Seed Technology

Course Code: PLS 473

Credits = 02

Learning outcomes:

After completion of the course, the students will be able:

- To understand the seed development process and different ways of its processing
- To examine the various methods of Seed testing
- To explain the concept of hybrid seed production

UNIT-1

Overview of seed Technology: types of seeds and their characteristics, Development of seed and morphology, Difference between monocot and dicot seed, Seed Dormancy, methods of breaking dormancy

UNIT-2

Seed germination: pattern and basic requirement for germination, normal and abnormal seedlings, germination inhibitors, Evaluation of seed related traits

UNIT-3

Seed processing: Methods of seed conditioning, Methods used for seed treatment, Principles of seed storage: various methods for seed storage, factors affecting seed storage, Seed viability, Methods of testing of seed viability

UNIT-4

Overview of seed certification, Function of seed certification agency, Seed Legislation and Act in India, Basic concept of seed pathology and seed entomology.

UNIT-5

Principles and methods of seed production, Importance of seed marketing, Concept of hybrid seed and its production

Reference Books:

1. Agrawal, P. K., (2010). Principles of Seed Technology. Indian Council of Agricultural Research, New Delhi.
2. Agrawal, R.L. (2015). Seed Technology. Oxford & Ibh Publishing Co Pvt Ltd.
3. Basra, A. (2006). Handbook of Seed Science and Technology. CRC Press.
4. Khare, D. and Bhale, M. S. (2014). Seed Technology 2nd Revision, Jain Book


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