



List of New Course(s) Introduced

Department : Botany

Programme Name : B.Sc. Honours

Academic Year : 2018-19

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
01.	LS/BOT/CP/306	Economic Botany
02.	LS/BOT/GE/303	Economic Botany and Plant Biotechnology
03.	LS/BOT/GE/404	Environmental Technology
04.	LS/BOT/DSE/501B	Natural Resource Management
05.	LS/BOT/DSE/603A	Industrial and Environmental Microbiology
06.	LS/BOT/DSE/603B	Plant Breeding
07.	LS/BOT/SEC301	Bio-fertilizers
08.	LS/BOT/SEC302	Herbal Technology
09.	LS/BOT/SEC401	Medicinal Botany
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Scheme and Syllabus Attached

Signature & Seal of HOD

विभागाध्यक्ष

Head

वनस्पति शास्त्र विभाग

Department of Botany

गुरु घासीदास विश्वविद्यालय (केन्द्रीय वि.वि.), बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur (C.G.)

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**Proposed syllabus
for
UG (Hon's) BOTANY
based on**

**CHOICE BASED CREDIT SYSTEM
(Three year/six semesters)**

B.Sc. BOTANY HONOURS

To be implemented from the academic session 2018-2019

**Department of Botany
School of Life Science
GURU GHASIDAS VISHWAVIDYALAYA
Koni, Bilaspur (CG)
B.Sc. (BOTANY) Hon's**

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Preamble

Today plant science is a fusion of the traditional components with the modern aspects of biochemistry, molecular biology and biotechnology. Over the years, plant science (Botany) has shown enormous gain in information and applications owing to tremendous inputs from research in all its aspects. With global recognition of the need for conservation, field plant biologists have contributed significantly in assessing plant diversity. Taxonomists have explored newer dimensions for the classification of plants. New insights have been gained in functional and structural aspects of plant development by utilizing novel tools and techniques for botanical research. Challenging areas of teaching and research have emerged in ecology and reproductive biology. Concern for ever increasing pollution and climate change is at its highest than ever before. Keeping these advancements in view, a revision of the curriculum at the undergraduate level is perfectly timed. From the beginning of 2014-15 session, the Botany students across Indian Universities shall have the benefit of a balanced, carefully-crafted course structure taking care of different aspects of plant science, namely plant diversity, physiology, biochemistry, molecular biology, reproduction, anatomy, taxonomy, ecology, economic botany and the impact of environment on the growth and development of plants. All these aspects have been given due weightage over the six semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the world of plants up to the sub-cellular level. A paper on this aspect is proposed to provide such an opportunity to the students before they engage themselves with the learning of modern tools and techniques in plant science. Keeping the employment entrepreneurship in mind, applied courses have also been introduced. These courses shall provide the botany students hands on experience and professional inputs. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Botany with the new curriculum will be a complete botanist at Honours level.

Students should be encouraged to opt for at least 1 or 2 Generic Electives from other Life Sciences like Zoology/Biotechnology/Forensic Science/Anthropology and Chemistry courses.

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SCHOOL OF SCIENCES: (LIFE SCIENCE)
B.Sc. (BOTANY) Hon's

SEMESTER I

Semester	Course Opted	Course Code	Name of the course	Credit	Hour / week	End semester marks	Internal Marks	Total marks
Semester I	Core-1	LS/BOT/C-101L	Phycology and Microbiology	4	4	35	15	50
	Core-1 Practical	LS/BOT/C-101P	Practical based on core 1	2	4	35	15	50
	Core-2	LS/BOT/C-102L	Bio-molecules and cell Biology	4	4	35	15	50
	Core-2 Practical	LS/BOT/C-102P	Practical based on core 2	2	4	35	15	50
	Generic Elective-1 (GE- 1)	LS/BOT/GE-101L	Opted from the basket	4	4	35	15	50
	Generic Elective-1 Practical	LS/BOT/GE-101P	Practical based on GE-1	2	4	35	15	50
	Ability Enhancement Compulsory Course-1 (AECC)	LS/BOT/AE-101EC	English Communication	4*	4	35	15	50
	ECA	LS/BOT/ECA-101	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhita/ vocational Training/ Sports/ others	2	(2)	35	15	50
			TOTAL	24	28			400

SEMESTER II

Semester II	Core-3	LS/BOT/C-203L	Mycology and Phytopathology	4	4	35	15	50
	Core-3 Practical	LS/BOT/C-203P	Practical based on core 3	2	4	35	15	50

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Core- 4	LS/BOT/C-204L	Archegoniate	4	4	35	15	50
Core- 4 Practical	LS/BOT/C-204P	Practical based on core 4	2	4	35	15	50
Generic Elective-2 (GE-1B)	LS/BOT/GE-202L	Elective from the Basket	4	4	35	15	50
Generic Elective-2- Practical	LS/BOT/GE-202P	Practical based on GE-2	2	4	35	15	50
Ability Enhancement Compulsory Course-2 (AECC)	LS/BOT/AE-202-ES	Environmental Science	4*	4	35	15	50
ECA		ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)	35	15	50
		Total	24	28			400

SUMMER Internship: 15 days	LS/BOT/SI-201	Swayam/ Swachhta / NSS / Industrial/ others	2	100	35	15	50
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SEMESTER III

Semester III	Core- 5	LS/BOT/C-305L	Anatomy of Angiosperm	4	4	35	15	50
	Core- 5 Practical	LS/BOT/CP-305P	Practical based on core 5	2	4	35	15	50
	Core- 6	LS/BOT/C-306L	Economic Botany	4	4	35	15	50
	Core- 6 Practical	LS/BOT/CP-306P	Practical based on core 6	2	4	35	15	50
	Core- 7	LS/BOT/C-307L	Genetics	4	4	35	15	50
	Core- 7 Practical	LS/BOT/CP-307P	Practical based on core 7	2	4	35	15	50

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	Generic Elective-3 (GEII-A)	LS/BOT/GE-303L	Elective from the Basket	4	4	35	15	50
	Generic Elective-3-Practical	LS/BOT/GEP-303P	Practical based on GE-3	2	4	35	15	50
	Skill Enhancement Course (SEC-1)	LS/BOT/SEC-301L	From the Basket	2	2	35	15	50
	Skill Enhancement Course (SEC-1) practical/Training/field visit	LS/BOT/SEC-301P	Based on the selected course	2	2	35	15	50
			Total	28	34			500

SEMESTER IV

Semester IV	Core- 8	LS/BOT/C-408L	Molecular Biology	4	4	35	15	50
	Core- 8 Practical	LS/BOT/C-408P	Practical based on core 8	2	4	35	15	50
	Core- 9	LS/BOT/C-409L	Plant Ecology and Phytogeography	4	4	35	15	50
	Core- 9 Practical	LS/BOT/C-409P	Practical based on core 9	2	4	35	15	50
	Core-10	LS/BOT/C-410L	Plant Systematics	4	4	35	15	50
	Core-10 Practical	LS/BOT/C-410P	Practical based on core 10	2	4	35	15	50
	Generic Elective- 4 (GEII-B)	LS/BOT/GE-404L	Elective from the Basket	4	4	35	15	50
	Generic Elective-4-Practical	LS/BOT/GE-404P	Practical based on GE-3	4	4	35	15	50
	Skill Enhancement Course (SEC -2)	LS/BOT/SEC-402L	From the SEC basket	2	2	35	15	50

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	Skill Enhancement Course (SEC-2) practical/Training/field visit	LS/BOT/SEC-402P	Based on the selected SEC course	2	2	35	15	50
			TOTAL	28	34			500
SUMMER Internship: 15 days								
SUMMER Internship: 15 days		LS/BOT/SI-402	Swayam Swachhta / NSS / Industrial/ others	2	100	35	15	50
SEMESTER V								
Semester V	Core-11	LS/BOT/C-511L	Reproductive Biology of Angiosperm	4	4	35	15	50
	Core -11 Practical	LS/BOT/CP-511P	Practical based on core 11	2	4	35	15	50
	Core -12	LS/BOT/C-512L	Plant Physiology	4	4	35	15	50
	Core -12 Practical	LS/BOT/CP-512P	Practical based on core 12	2	4	35	15	50
	Discipline Specific Elective (DSE-1)	LS/BOT/DSE-501AL LS/BOT/DSE-501BL	A) Analytical Technique in Plant Science B) Natural Resource Management	4	4	35	15	50
	DSE-1 - Practical	LS/BOT/DSE-501AP LS/BOT/DSE-501BP	Practical based on DSE-1	2	4	35	15	50
	Discipline Specific Elective (DSE-2)	LS/BOT/DSE-502AL LS/BOT/DSE-502BL	A) Biostatistics B) Bioinformatics	4	4	35	15	50
	DSE-2 - Practical	LS/BOT/DSE-502AP LS/BOT/DSE-502BP	Practical based on DSE-2	2	4	35	15	50
				TOTAL	24	32		

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SEMESTER VI								
Semester VI	Core-13	LS/BOT/C-613L	Plant Metabolism	4	4	35	15	50
	Core -13 Practical	LS/BOT/CP-613P	Practical based on core 13	2	4	35	15	50
	Core -14	LS/BOT/C-614L	Plant Biotechnology	4	4	35	15	50
	Core -14 Practical	LS/BOT/CP-614P	Practical based on core 14	2	4	35	15	50
	Discipline Specific Elective (DSE-3)	LS/BOT/DSE 603AL LS/BOT/DSE 603BL	A) Industrial and Environmental Microbiology B) Plant Breeding	4	4	35	15	50
	DSE-3 - Practical	LS/BOT/DSE 603AP LS/BOT/DSE 603BP	Practical based on DSE-3	2	4	35	15	50
	Dissertation / Project work followed by seminar	LS/BOT/PD-601	Dissertation/ Project work followed by seminar	5 + 1 = 6	8	70	30	100
			TOTAL	24	32			400
		TOTAL CREDITS	152 + 4 (SI)					

1. Continuous Internal assessment should be evaluated by two components: Seasonal test + assignment
2. Marks distribution as proposed (70/30 ratio End semester/ continuous internal assessment) / According to the final ordinance

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Course offered by Botany

(Course Basket)

Generic Electives

1. Biodiversity (Microbes, Algae, Fungi and Archegoniate)
2. Plant Physiology and Metabolism
3. Economic Botany and Biotechnology
4. Environmental Technology

Discipline Specific Electives

1. Analytical Techniques in Plant Sciences
2. Bioinformatics
3. Plant Breeding
4. Natural Resource Management
5. Industrial and Environmental Microbiology
6. Biostatistics

Ability Enhancement Course Compulsory

1. English/MIL Communication
2. Environmental Science

Skill enhancement course Elective

1. Bio-fertilizers
2. Herbal Technology
3. Medicinal Botany
4. Plant Diversity and Human Welfare
5. Mushroom Culture Technology
6. Intellectual Property Rights

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Core Course VI: Economic Botany**(Credits: Theory-4, Practical-2)****THEORY (Lectures: 60)****Unit 1: Origin of Cultivated Plants****(6 lectures)**

Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.

Unit 2: Cereals (6 lectures) Wheat and Rice (origin, morphology, processing & uses); Brief account of millets.

Unit 3: Legumes**(6 lectures)**

Origin, morphology and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.

Unit 4: Sources of sugars and starches**(4 lectures)**

Morphology and processing of sugarcane, products and y-products of sugarcane industry. Potato - morphology, propagation & uses.

Unit 5: Spices

Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper

Unit 6: Beverages

Tea, Coffee (morphology, processing & uses)

(4 lectures)**Unit 7: Sources of oils and fats****(10 lectures)**

General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.

Unit 8: Natural Rubber

Para-rubber: tapping, processing and uses.

(3 lectures)**Unit 9: Drug-yielding plants****(8 lectures)**

Therapeutic and habit-forming drugs with special reference to *Cinchona*, *Digitalis*, *Papaver* and *Cannabis*; Tobacco (Morphology, processing, uses and health hazards).

Unit 10: Timber plants

General account with special reference to teak and pine.

(3 Lectures)**Unit 11: Fibers****(4 lectures)**

Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).

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Practical

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1. **Cereals:** Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).
 2. **Legumes:** Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).
 3. **Sources of sugars and starches:** Sugarcane (habit sketch; cane juice- micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).
 4. **Spices:** Black pepper, Fennel and Clove (habit and sections).
 5. **Beverages:** Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).
 6. **Sources of oils and fats:** Coconut- T.S. nut, Mustard-plant specimen, seeds; tests for fats in crushed seeds.
 7. **Essential oil-yielding plants:** Habit sketch of *Rosa*, *Vetiveria*, *Santalum* and *Eucalyptus* (specimens/photographs).
 8. **Rubber:** specimen, photograph/model of tapping, samples of rubber products.
 9. **Drug-yielding plants:** Specimens of *Digitalis*, *Papaver* and *Cannabis*.
 10. **Tobacco:** specimen and products of Tobacco.
 11. **Woods:** *Tectona*, *Pinus*: Specimen, Section of young stem.
 12. **Fiber-yielding plants:** Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).

Suggested Readings

1. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
3. Chrispeels, M.J. and Sadava, D.E. 1994 Plants, Genes and Agriculture. Jones & Bartlett Publishers.

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GENERIC ELECTIVE

Economic Botany and Plant Biotechnology

New course

(Credits: Theory-4, Practical-2)

THEORY (Lectures: 60)

- Unit 1: Origin of Cultivated Plants** (4 lectures)
Concept of centres of origin, their importance with reference to Vavilov's work.
- Unit 2: Cereals** (4 lectures)
Wheat -Origin, morphology, uses
- Unit 3: Legumes** (6 lectures)
General account with special reference to Gram and soybean
- Unit 4: Spices** (6 lectures)
General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)
- Unit 5: Beverages** (4 lectures)
Tea (morphology, processing, uses)
- Unit 6: Oils and Fats** (4 lectures)
General description with special reference to groundnut
- Unit 7: Fibre Yielding Plants** (4 lectures)
General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)
- Unit 8: Introduction to biotechnology** (2 lecture)
- Unit 9: Plant tissue culture** (8 lectures)
Micropropagation ; **haploid production through androgenesis and gynogenesis**; brief account of **embryo and endosperm culture with their applications**
- Unit 10: Recombinant DNA Techniques** (18 Lecture)
Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting, Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immunodetection. Molecular diagnosis of human disease, Human gene Therapy

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Practical

1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests
2. Familiarization with basic equipments in tissue culture.
3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.
4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.

Suggested Readings

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd, New Delhi. 4th edition.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

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GENERIC ELECTIVE

Environmental Technology

(Credits: Theory-4, Practical-2)

THEORY (Lectures: 60)

Unit 1: Environment

(4 lectures)

Basic concepts and issues, global environmental problems - ozone depletion, UV-B, greenhouse effect and acid rain due to anthropogenic activities, their impact and biotechnological approaches for management.

Unit 2: Environmental problems

✓ New course

(6 lectures)

Environmental pollution - types of pollution, sources of pollution, measurement of pollution, methods of measurement of pollution, fate of pollutants in the environment, Bioconcentration, bio/geomagnification.

Unit 3: Microbiology of waste water treatment

✓ New course

(8 lectures)

Aerobic process - activated sludge, oxidation ponds, trickling filter, towers, rotating discs, rotating drums, oxidation ditch. Anaerobic process - anaerobic digestion, anaerobic filters, up-flow anaerobic sludge blanket reactors. Treatment schemes for waste waters of dairy, distillery, tannery, sugar and antibiotic industries.

Unit 4: Xenobiotic compounds

(10 lectures)

Organic (chlorinated hydrocarbons, substituted simple aromatic compounds, polyaromatic hydrocarbons, pesticides, surfactants) and inorganic (metals, radionuclides, phosphates, nitrates). Bioremediation of xenobiotics in environment - ecological consideration, decay behavior and degradative plasmids, molecular techniques in bioremediation.

Unit 5: Role of immobilized cells/enzymes in treatment of toxic compounds

Biopesticides, bioreactors, bioleaching, biomining, biosensors, biotechniques for air pollution abatement and odour control.

(6 lectures)

Unit 6: Sustainable Development

(8 lectures)

Economics and Environment: Economic growth, Gross National Productivity and the quality of life, Tragedy of Commons, Economics of Pollution control, Cost-benefit and cost effectiveness analysis, WTO and Environment, Corporate Social Responsibility, Environmental awareness and Education; Environmental Ethics.

New course

Unit 7: International Legislations, Policies for Environmental Protection

Stockholm Conference (1972) and its declaration, WCED (1983) and Brundtland Report (1987), Rio Earth Summit-UNCED (1992) and its declaration, Montreal Protocol - 1987, Basel Convention (1989), Kyoto Protocol- 1997, Ramsar Convention 1971.

(6 lectures)

New course

Unit 8: National Legislations, Policies for Pollution Management

(6 lectures)

Salient features of Wild life protection act 1972, Water Pollution (Prevention and Control) Act-1974, Forest conservation act 1980, Air Pollution (Prevention and Control) Act-1981,

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National Environmental Policy -2006, Central and State Pollution Control Boards: Constitution and power.

Unit 9: Public Participation for Environmental Protection

(6 lectures)

Environmental movement and people's participation with special references to Gandhamardan, Chilika and Narmada Bachao Andolan, Chipko and Silent valley Movement; Women and Environmental Protection, Role of NGO in bringing environmental awareness and education in the society.

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Practical

1. Water/Soil analysis - DO, salinity, pH, chloride, total hardness, alkalinity, acidity, nitrate, calcium, Magnesium and phosphorus.
2. Gravimetric analysis-Total solid, dissolved solid, suspended solid in an effluent
3. Microbial assessment of air (open plate and air sample) and water

Suggested Readings

1. Waste water engineering - treatment, disposal and reuse, Metcalf and Eddy Inc., Tata McGraw Hill, New Delhi.
2. Environmental Chemistry, AK. De, Wiley Eastern Ltd, New Delhi.
3. Introduction to Biodeterioration, D.Allsopp and K.J. Seal, ELBS / Edward Arnold.
4. Bioremediation, Baaker, KH and Herson D.S., 1994. Mc GrawHill Inc, NewYork
5. Industrial and Environmental Biotechnology - Nuzhat Ahmed, Fouad M. Qureshi and Obaid Y. Khan, 2006 Horizon Press.
6. Environmental Molecular Biology, Paul. A. Rochelle, 2001. Horizon Press.
7. Environmental Protection and Laws by Jadhav and Bhosale, V.M.Himalaya publ. House
13. Biodiversity Assessment and Conservation by PC Trivedi, Agrobios publ.

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DISCIPLINE SPECIFIC ELECTIVE

✓ New course

Natural Resource Management

(Credits: Theory-4, Practical-2)

THEORY (Lectures: 60)

Unit 1: Natural resources:

Definition and types. (2 lectures)

Unit 2: Sustainable utilization:

Concept, approaches (economic, ecological and socio-cultural). (8 lectures)

Unit 3: Land

(8 lectures)

Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation and management.

Unit 4:

(8 lectures)

Water: Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies.

Unit 5:

(12 lectures)

Biological Resources: Biodiversity-definition and types; Significance; Threats; Management strategies; Bio-prospecting; IPR; CBD; National Biodiversity Action Plan).

Unit 6:

(6 lectures)

Forests: Definition, Cover and its significance (with special reference to India); Major and minor forestproducts; Depletion; Management.

Unit 7: (6 lectures)Energy: Renewable and non-renewable sources of energy

Unit 8

(8 lectures)

Contemporary practices in resource management: EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management.

Unit 9:

National and international efforts in resource management and conservation (4 lectures)

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Practical

1. Estimation of solid waste generated by a domestic system (biodegradable and non-biodegradable) and its impact on land degradation.
2. Collection of data on forest cover of specific area.
3. Measurement of dominance of woody species by DBH (diameter at breast height) method.
4. Calculation and analysis of ecological footprint.
5. Ecological modeling.

Suggested Readings

1. Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi.
2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
3. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.

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DISCIPLINE SPECIFIC ELECTIVE

New course

Industrial and Environmental Microbiology

(Credits: Theory-4, Practical-2)

THEORY (Lectures: 60)

Unit 1: Scope of microbes in industry and environment (6 lectures)

Unit 2: Bioreactors/Fermenters and fermentation processes (12 lectures)

Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors-laboratory, pilotscale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter.

Unit 3: Microbial production of industrial products (12 lectures)

Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)

Unit 4: Microbial enzymes of industrial interest and enzyme immobilization

(8 lectures)

Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).

Unit 5: Microbes and quality of environment (6 lectures)

Distribution of microbes in air; Isolation of microorganisms from soil, air and water.

Unit 6: Microbial flora of water. (8 lectures)

Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.

Unit 7: Microbes in agriculture and remediation of contaminated soils. (8 lectures)

Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.

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Practical

1. Principles and functioning of instruments in microbiology laboratory
2. Hands on sterilization techniques and preparation of culture media.
3. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.

Suggested Readings

1. Pelzar, M.J. Jr., Chen E.C. S., Krieg, N.R. (2010). Microbiology: An application based approach. Tata McGraw Hill Education Pvt. Ltd., Delhi.
2. Tortora, G.J., Funke, B.R., Case. C.L. (2007). Microbiology. Pearson Benjamin Cummings, San Francisco, U.S.A. 9th edition.

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DISCIPLINE SPECIFIC ELECTIVE ✓

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Plant Breeding

(Credits: Theory-4, Practical-2)

THEORY (Lectures: 60)

Unit 1: Plant Breeding (10 lectures)

Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.

Unit 2: Methods of crop improvement (20 lectures)

Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants - Procedure, advantages and limitations.

Unit 3: Quantitative inheritance (10 lectures)

Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.

Unit 4: Inbreeding depression and heterosis (10 lectures)

History, genetic basis of inbreeding depression and heterosis; Applications.

Unit 5: Crop improvement and breeding (10 lectures)

Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.

Practical

Based on the above paper

Suggested Readings

1. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.
2. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford - IBH. 2nd edition.
3. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.

Nilu
28/5/2018

Paul
20.5.10

Jayashankar
28/6/10

SKILL ENHANCEMENT COURSE

New
Course

Biofertilizers

(Credits: Theory 2, Practical Training/ Field visit -2)

THEORY (Lectures: 30)

Unit 1: General account about the microbes used as biofertilizer - Rhizobium - isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.

(4 lectures)

Unit 2: *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.

(8 lectures)

Unit 3: Cyanobacteria (blue green algae), *Azolla* and *Anabaena azollae* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation.

(4 lectures)

Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield - colonization of VAM - isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

(8 lectures)

Unit 5: Organic farming - Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes - biocompost making methods, types and method of vermicomposting - field Application.

(6 lectures)

Practical/ Training/Field visit

Based on Theory paper

Suggested Readings

1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand & Co, New Delhi.
2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
6. Vayas, S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

MM
28/5/2018

Jan
20.5.18

Shreshth
28/5/18

SKILL ENHANCEMENT COURSE

New course.

Herbal Technology

(Credits: Theory 2, Practical Training/ Field visit -2)

THEORY (Lectures: 30)

Unit 1:Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants. **(6 Lectures)**

Unit 2: Pharmacognosy - systematic position and medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka. **(6 Lectures)**

Unit 3:Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster). **(6 Lectures)**

Unit 4:Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds) **(8 Lectures)**

Unit 5:Medicinal plant banks micro propagation of important species (*Withania somnifera*, neem and tulsi- Herbal foods-future of pharmacognosy) **(4 Lectures)**

Practical/ Training/Field visit

Based on Theory paper

Suggested Readings

1. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
3. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
4. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.
5. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
6. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
7. Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

Neelam
28/5/2018

Janal
20.5.18

Jayalakshi
28/5/18

SKILL ENHANCEMENT COURSE

Medicinal Botany

New course

(Credits: Theory 2, Practical Training/ Field visit -2)

THEORY (Lectures: 30)

Unit 1:

History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept; Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations. (10 Lectures)

new

Unit 2:

Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: (6 Lectures)

Repeat

Unit 3.

Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding. (4 Lectures)

Unit 4:

Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. (6 Lectures)

new

Unit 5

Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases. (4 Lectures)

Practical/ Training/Field visit

Based on Theory paper

Suggested Readings

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.

Ally
28/5/2018

Jan
20.5.18

Jayesh
28/5/18