List of New Course(s) Introduced

Department : ***Department of Forestry, Wildlife & Environmental Sciences***

Programme Name : ***B. Sc. Organic Farming***

Academic Year : 2022-23

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
1.	OFUATT1	Introductory Organic Farming Principles
2.	OFUATT2	Organic Agronomical Practices
3.	OFUATG1	Nursery Technology
4.	OFUATA1	Ability Enhancement Course (AEC-01)
5.	OFUATL1	Skill Enhancement Course (SEC-01)
6.	OFUATS1	ECA-Extra-curricular activity (Field visit/ NSS/NCC/ *Swachhta*/ Physical Education/ Plantation Activities)
7.	OFUBTT3	Soil and Water Management
8.	OFUBTT4	Plant Protection and Bio-pesticides
9.	OFUBTG2	Farm Machinery
10.	OFUBTA2	Ability Enhancement Course (AEC-02)
11.	OFUBTL2	Skill Enhancement Course (SEC-02)
12.	OFUBTS2	ECA-Extracurricular activity(Field visit/ NSS/ Swachhta/ vocational Training/ Sports/ Plantation activities)
13.	OFUCTT5	Orchard Farming
14.	OFUCTT6	Organic Farming & Biofertilizers
15.	OFUCTT7	Basics of Plant Genetics and Plant Breeding
16.	OFUCTG3	Organic Farming Startups and Entrepreneurship
17.	OFUCTA3	Ability Enhancement Course (AEC-03)

18.	OFUCTS3	ECA-Extracurricular activity(Field visit/ NSS/ Swachhta/ vocational Training/ Sports/ Plantation activities)
19.	OFUDTT8	Biodynamic Farming
20.	OFUDTT9	Carbon Neutral Farming
21.	OFUDTT10	Urban Farming and Terrace Gardening
22.	OFUDTG4	Methods of Soil, Plant, Water & Seed Testing
23.	OFUDTA4	Ability Enhancement Course (AEC-04)
24.	OFUETT11	Fundamentals of Agroforestry
25.	OFUETT12	Floriculture
26.	OFUETT13	Residue Management Practices and Manure Production
27.	OFUETD1	Climatology and Meteorology OR Sericulture Technology
28.	OFUFTT14	Vegetable Farming
29.	OFUFTT15	Medicinal & Aromatic Plants Farming
30.	OFUFTD2	Harvesting Organic Produce, Quality Analysis and Improvement OR Post-Harvest management and Value Addition
31.	OFUFTA5	Ability Enhancement Course (AEC-05)
32.	MOOC Course (01)	Online MOOC Course
33.	OFUGTT16	Biostatistics
34.	OFUGTT17	Genetic Engineering and Transgenic Plants
35.	OFUFTT18	Organic Certification
36.	OFUGTD3	Mushroom Technology OR Apiculture Technology
37.	OFUGSS1	Seminar/Experimental learning: NTFP processing, Compost production, Vermi-composting and value addition, Nursery production
38.	OFUHEF1	Farming operation Work Experience (Report Writing, Presentation, Viva-Voce)

39.	OFUHEF2	Institute and Industrial visit/training (Report Writing, Presentation, Viva-Voce)
40.	OFUHDF1	Dissertation writing, Presentation, Viva-Voce

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2021-22

School : ***Natural Resources***

Department : ***Department of Forestry, Wildlife & Environmental Sciences***

Date and Time : ***29/04/2022 at 11:00 AM***

Venue : ***E-Class Room***

The scheduled meeting of member of Board of Studies (BoS) of Department of Forestry, Wildlife & Environmental Sciences, School of Natural Resources, Guru Ghasidas Vishwavidyalaya, and Bilaspur was held to design and discuss the B. Sc. Organic Farming Four years (8 Semester degree program scheme and syllabi as per Learning Outcome Based Curriculum Framework (LOCF).

The following members were present in the meeting:

1. Prof. Manmohan J. Dobriyal (External Expert Member BoS, Dept. of Forest Genetics., FRI, Dehradun) (Through online)
2. Prof. S S Singh (Member BoS, Department of Forestry, Wildlife & Environmental Sciences)
3. Dr. K.K. Chandra (HOD, Associate Prof., Department of Forestry, Wildlife & Environmental Sciences, Chairman, BOS)
4. Dr. Rashmi Agarwal (Member BoS, Assistant Professor, Department of Forestry, Wildlife & Environmental Sciences)
5. Dr. Bhavana Dixit (Member BoS, Assistant Professor, Department of Forestry, Wildlife & Environmental Sciences)

Following points were discussed during the meeting

- A meeting of Board of Studies (BoS) of Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya was held on 29/04/2022 at 11:00 AM in the Department of Forestry.
- The detailed syllabus and course structure of the new program of B.Sc. Organic farming was discussed in the meeting. All the comments made by the external member were incorporated in the syllabus of 4 years undergraduate course of B.Sc. Organic Farming.
- The ordinance of B.Sc. Organic Farming program was also discussed in depth and finalized in the meeting.

The BoS recommends the syllabus and Ordinance of the new program of B.Sc. Organic Farming a four years degree program scheme and syllabi as per Learning Outcome Based Curriculum Framework (LOCF).

विभागाध्यक्ष
Head
वानिकी, वन्यजीव एवं पर्यावरण विभाग
Department of Forestry, Wildlife and Environmental Science
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD

Scheme and Syllabus

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (LOCF)

FOR

B.Sc. Organic Farming
(A Four Years Degree Program)

(w.e.f. Academic session:2022-23)

"SCHOOL OF NATURAL RESOURCES"

DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCES

GURU GHASIDAS VISHWAVIDYALAYA

(A Central University established by the Central University Act.2009 No. 25 of 2009)

BILASPUR-495009, CHHATTISGARH

Course Structure and Credit Distribution

B.Sc. Organic Farming (4 -Year / 8- Semester) LOCF based Program

Semester	Course Opted	Course Code	Name of the course	Credit	Hour/ week	Marks
I	Core-01	OFUATT1	Introductory Organic Farming Principles	3	3	100
	Core-01 Practical	OFUALT1	Introductory Organic Farming Principles	2	3	100
	Core-02	OFUATT2	Organic Agronomical Practices	3	3	100
	Core-02 Practical	OFUALT1	Organic Agronomical Practices	2	3	100
	Generic Elective (GE)-01	OFUATG1	Nursery Technology	3	3	100
	Practical/Seminar	OFUAlG1	Nursery Technology	2	3	100
	Ability Enhancement Course (AEC-01)	OFUATA1	Drawn from the University Pool	2	-	100
	Skill Enhancement Course(SEC-01)	OFUATL1	Drawn From the University pool	2	-	100
	Extra Curricular Activity-(ECA-01) *Additional Credit Course	OFUATS1	ECA-Extra-curricular activity (Field visit/ NSS/NCC/ *Swachhta*/ Physical Education/ Plantation Activities)	2	-	
	TOTAL			**21**	**18**	**800**
II	Core -03	OFUBTT3	Soil and Water Management	3	3	100
	Core -03 Practical	OFUBLT3	Soil and Water Management	2	3	100
	Core -04	OFUBTT4	Plant Protection and Bio-pesticides	3	3	100
	Core -04 Practical	OFUBLT4	Plant Protection and Bio-pesticides	2	3	100
	Generic Elective (GE)-02	OFUBTG2	Farm Machinery	3	3	100
	Generic	OFUBLG2	Farm Machinery	2	3	100

29.4.2022 29.04.2022 29/4/22 29.4.2022

	Elective (GE)-02 Practical					
	Ability Enhancement Compulsory (AEC-02)	OFUBTA2	Drawn from the university pool	2	2	100
	Skill Enhancement Course(SEC-02)	OFUBTL2	Drawn From the University pool	2	-	100
	Extracurricular Activity-(ECA-02) *Additional Credit Course	OFUBTS2	ECA-Extracurricular activity(Field visit/ NSS/ Swachhta/ vocational Training/ Sports/ Plantation activities)	2	-	100
	TOTAL			**21**	**20**	**900**

Semester	Course Opted	Course Code	Name of the course	Credit	Hour/ weak	Marks
III	Core -05	OFUCTT5	Orchard Farming	3	3	100
	Core -05 Practical	OFUCLT5	Orchard Farming	2	3	100
	Core -06	OFUCTT6	Organic Farming & Biofertilizers	3	3	100
	Core -06 Practical	OFUCLT6	Organic Farming & Biofertilizers	2	3	100
	Core -07	OFUCTT7	Basics of Plant Genetics and Plant Breeding	3	3	100
	Core - 07Practical	OFUCLT7	Basics of Plant Genetics and Plant Breeding	2	3	100
	Generic Elective-(GE)-03	OFUCTG3	Organic Farming Startups and Entrepreneurship	3	3	100
	Generic Elective (GE-3) Practical	OFUCLG3	Organic Farming Startups and Entrepreneurship	2	3	100
	Ability Enhancement Course(AEC-03)	OFUCTA3	Drawn From the University Pool	2	-	100
	Extracurricular Activity-(ECA-03) *Additional Credit Course	OFUCTS3	ECA-Extracurricular activity (Field visit/ NSS/NCC/ Swachhta/ Physical Education/ Plantation Activities)	2	-	100
	Total			**24**	**24**	**1000**

29.4.2022 29.04.2022 29.4.2022

IV	Core -08	OFUDTT8	Biodynamic Farming	3	3	100
	Core - 08Practical	OFUDLT8	Biodynamic Farming	2	3	100
	Core -09	OFUDTT9	Carbon Neutral Farming	3	3	100
	Core -09 Practical	OFUDLT9	Carbon Neutral Farming	2	3	100
	Core -10	OFUDTT10	Urban Farming and Terrace Gardening	3	3	100
	Core -10 Practical	OFUDLT10	Urban Farming and Terrace Gardening	2	3	100
	Generic Elective-(GE)-04	OFUDTG4	Methods of Soil, Plant, Water & Seed Testing	3	3	100
	Generic Elective Practical(GE)-04	OFUDLG4	Methods of Soil, Plant, Water & Seed Testing	2	3	100
	Ability Enhancement Course(AEC-04)	OFUDTA4	Drawn From the University pool	2	-	100
	TOTAL			**22**	**24**	**900**
V	Core -11	OFUETT11	Fundamentals of Agroforestry	3	3	100
	Core -11 Practical	OFUELT11	Fundamentals of Agroforestry	2	3	100
	Core -12	OFUETT12	Floriculture	3	3	100
	Core -12 Practical	OFUELT12	Floriculture	2	3	100
	Core -13	OFUETT13	Residue Management Practices and Manure Production	3	3	100
	Core -13 Practical	OFUELT13	Residue Management Practices and Manure Production	2	3	100
	Discipline Specific Elective DSE-1	OFUETD1	Climatology and Meteorology	3	3	100
	Practical	OFUELD1	Climatology and Meteorology	2	3	100
			OR			
		OFUELD1	Sericulture Technology	3	3	100
	Practical	OFUELD1	Sericulture Technology	2	3	100
	TOTAL			**20**	**24**	**800**

29.4.2022 29.04.2022 29/4/22 SJ Singh 29.6.22

VI	Core -14	OFUFTT14	Vegetable Farming	3	3	100
	Core -14 Practical	OFUFLT14	Vegetable Farming	2	3	100
	Core -15	OFUFTT15	Medicinal & Aromatic Plants Farming	3	3	100
	Core -15 Practical	OFUFLT15	Medicinal & Aromatic Plants Farming	2	3	100
	Discipline Specific Elective-(DSE-02)	OFUFTD2	Harvesting Organic Produce, Quality Analysis and Improvement	3	3	100
	Practical	OFUFLD2	Harvesting Organic Produce, Quality Analysis and Improvement	2	3	100
	OR					
	Discipline Specific Elective-(DSE-02)	OFUFTD2	Post-Harvest management and Value Addition	3	3	100
	Practical	OFUFLD2	Post-Harvest management and Value Addition	2	3	100
	Ability Enhancement Course (AEC-05)	OFUFTA5	Drawn from the University Pool	2	-	100
	MOOC Course (01)		Online MOOC Course	2-4	-	-
	TOTAL			**17+ 2-4**	**18**	**700**
VII	Core -16	OFUGTT16	Biostatistics	3	3	100
	Core -16 Practical	OFUGLT16	Biostatistics	2	3	100
	Core -17	OFUGTT17	Genetic Engineering and Transgenic Plants	3	3	100
	Core -17 Practical	OFUGLT17	Genetic Engineering and Transgenic Plants	2	3	100
	Core -18	OFUFTT18	Organic Certification	3	3	100
	Core -18 Practical	OFUFLT18	Organic Certification	2	3	100
	Discipline Specific Elective-(DSE-3)	OFUGTD3	Mushroom Technology	3	3	100

29.4.2022 29.04.2022 29/4/22 29.4.2022

	Practical	OFUGLD3	Mushroom Technology	2	3	100
	OR					
	Discipline Specific Elective-(DSE-3)	OFUGTD3	Apiculture Technology	3	3	100
	Practical	OFUGLD3	Apiculture Technology	2	3	100
	Seminar (S1)	OFUGSS1	Seminar/Experimental learning: NTFP processing, Compost production, Vermi-composting and value addition, Nursery production	2	2	100
	TOTAL			**22**	**26**	**900**
VIII	INTR -1	OFUHEF1	Farming operation Work Experience (Report Writing, Presentation, Viva-Voce)	6		200
	INTR -2	OFUHEF2	Institute and Industrial visit/training (Report Writing, Presentation, Viva-Voce)	6		200
	Dissertation	OFUHDF1	Dissertation writing, Presentation, Viva-Voce	6		200
			TOTAL	**18**		**600**
	The nature of the course in VIII Semester will be field based for learning exposure on agricultural operational/organic farming works through attachment with agriculture department/ Farmers group/ fertilizer industries/ Marketing agencies/NGOs. Institute/ industrial training will be accomplished by the students through visits of nearby farming based Industries / Institutions/ organic certification agencies. Dissertation will be required to inculcate research experience in the students.					
GRAND TOTAL			**165 + 2-4 (MOOC)**			**6500**

29.4.2022 29.4.22 29.4.2022 29.04.2022

Table 2: Structure of Courses

Semester	Core Courses (19)	GE (4)	DSE (3)	AEC (5)	SEC (2)	Seminar (1)	Dissertation (1)	Internship (3)	Additional Credit Courses (Optional)
I	C1 C2	GE1		AEC1	SEC1				ECA1
II	C3 C4	GE2		AEC2	SEC2				ECA2
III	C5 C6 C7	GE3		AEC3					ECA3
IV	C8 C9 C10	GE4		AEC4					
V	C11 C12 C13		DSE1						
VI	C14 C15		DSE2	AEC5					MOOC
VII	C16 C17 C18		DSE3			Seminar/ Experimental learning			
VIII							Dissertation	Internship1 Internship2	

29.04.2022 29.04.2022 29/4/22 29.4.2022

B. Sc. Degree in Organic Farming

SEMESTER I

PAPER 1: INTRODUCTORY ORGANIC FARMING PRINCIPLES (CORE-01)

CR: 3+2

Introduction to organic farming, aim, objective, scope and concept, principles and need of organic farming, agencies and institutions related to organic farming, types of organic farming, benefits of organic farming, conventional farming v/s organic farming, scope, potential and present status of organic farming: Chhattisgarh, national and international, essentials for organic farming, farm components for an organic farm.

PRACTICAL:

1. Visit of a farm around Bilaspur (CG) to identify their adopted techniques.
2. Field based experiment for organic farming.
3. Organic Farm Industry visit with the vision to know the comparative study of chemical based production and organic based production system.
4. Identification of types of organic farming.
5. Analysis of organic farming pattern at State, national and international levels.

Suggested Readings:

1. Veeresh G. K. (2011).Organic Farming,Publisher: Foundation Books. ISBN: 9788175968813 https://doi.org/10.1017/UPO9788175968813
2. Reddy S. R. (2017). Principles of Organic Farming. Publisher: Kalayani, ISBN : 9327274474.
3. Rateaver B. (1993). Organic method primer update: A practical explanation: the how and why for the beginner and the experience (Conservation gardening and farming). Publisher: The Rateavers; Special edition, ISBN: 0915966018.
4. Gershuny G. and Martin D. L. (2018). The Rodale Book of Composting, Newly Revised and Updated: Simple Methods to Improve Your Soil, Recycle Waste, Grow Healthier Plants, and Create an Earth-Friendly Garden (Rodale Classics). Publisher: Rodale Books; Updated edition, ISBN: 1635651026.

29.4.2022 29.4.2022 29.4.2022

PAPER-02: ORGANIC AGRONOMICAL PRACTICES (CORE-02) **CR.3+2**

Introduction of agriculture, crops, meaning of crop production, classification of crop plants, agronomic classification: cereal, legume, fibre, forage, sugar, oil crops, growing seasons, Crop production methods for rice, wheat, maize, cowpea, Dolichos bean (*Dolichos lablab*), green gram, black gram, pigeon pea, pea.

PRACTICAL

1. Paddy field visit and survey of organic cultivation.
2. Practical approaches of agricultural practices preparation of soil, sowing, adding manure and fertilisers, irrigation, protecting from weeds, harvesting, storage of paddy, wheat and maize
3. Analysis of organic cultivation techniques of leguminous vegetables
4. Cost benefit analysis of organic farming.

Suggested Readings:

1. Reddy S.R. (2014). Principles of Crop Production. Kalyani Publishers, ISBN-10: 9327218582.
2. An Introduction to Agriculture and Agronomy. 2015. http://www.newagepublishers.com/samplechapter/001757
3. Osiname I. C. and Sinha, T. D. (1999). Field Crop Production in Tropical Africa.Netherlands: CTA, Wageningen, Pp. 1-14.
4. Bassey E. (2019). Fundamental Principles of Crop Production. ISBN: 9781706242604, 1706242603. Publisher: Independently Published
5. Jena, J. and Jena, T. (2020). Glimpses of Crop Production. Publisher: Jain Brothers ISBN: 9788194484646

PAPER-03: NURSERY TECHNOLOGY **GE-01 CR: 3+2**

Nursery, introduction, objectives and scope, types of nursery, choosing nursery site, design and layout of the nursery, preparation of nursery beds, producing plant from seed, seed handling, dormancy and treatments, methods of sowing, time and season, potting mixtures, transplanting of young seedlings, plant containers, compost and mulches, nutrient and soil management, disease and pest control, sale and marketing.

29.4.2022 29.4.2022 29.4.2022 29.04.2022

PRACTICAL

1. Site selection and its assessment.
2. Preparation of different types of nursery bed
3. Application of seed treatment, seed sowing,
4. Preparation of potting mixtures, application of mulches,
5. Tools and instruments, nursery record
6. Assessment of plantation site, visit of nursery and plantations
7. Marketing management of nursery grown seedlings.

Suggested Readings:

1. Hall K. C. (2003). Manual on nursery practice. Forest Department, Jamaica. E book
2. Pawar P. (2007). Practical Manual of plantation forestry. Scientific publisher, Jodhpur
3. Sharma A. and Singh N. P. (2011). Soil and orchard management. Daya Publishing House, Delhi.
4. Luna R. K. (2006). Plantation forestry in India. International book distributor, Dehradun, India.

PAPER 4. ABILITY ENHANCEMENT COURSE (AEC-01) **CR: 2**

PAPER 5. SKILL ENHANCEMENT COURSE (SEC-01) **CR: 2**

PAPER 6. EXTRA CURRICULAR ACTIVITY (ECA-01) **CR: 2**

SEMESTER II

PAPER- 01. SOIL AND WATER MANAGEMENT (CORE-03) CR: 3+2

Introduction of soil, its formation and properties, plant nutrients, essential nutrients and their role, nutrient uptake phenomenon in plant nutrient cycle, soil tillage, choice of varieties, crop rotation multiple and cropping systems, intercropping in relation to maintenance of soil productivity, sources of nutrients, manures and fertilizers, benefits and drawback of chemical and organic fertilizer, concentrated organic manures, organic preparations, organic amendments and sludges, bio-fertilizers-methods of application, advantages and disadvantages, Standards for organic inputs- fertilizers.

Introduction to traditional and modern methods of water management, water management techniques in agriculture, horticulture and forestry, effects of soil type, soil texture, and inherent limitations, irrigation management, water management benefits of cover crops, irrigation management, watershed management, smart farming.

PRACTICAL:

1. Analysis of adopted farming system adopted for water conservation in Chhattisgarh.
2. Determination of water holding capacity of soil, soil moisture and field capacity.
3. Demonstration of Soil tillage operations.
4. Analysis of cropping systems and intercropping pattern of organic farming
5. Soil analysis to understand the correlation with water management practices
6. Identification of fertilizer.
7. Application methods of biofertilizers

Suggested Readings:

1. Singh S. Y. (2021). Soil Fertility and Plant Nutrient Management. Publisher: New India Publishing Agency- Nipa,ISBN: 9789390512270.
2. NPCS Board of Consultants & Engineers (2021). The Complete Book on Organic Farming and Production of Organic Compost. Publisher : Asia Pacific Business Press,ISBN-10 : 8194099528
3. MishraS. R.(2014). Soil and Nutrient Management. Publisher: Discovery Publishing House Pvt Ltd. ISBN: 9789350564578, 9350564572
4. Fawzy Z. F. (2020). Organic Crop Cultivation. Publisher: Excelic Press, ISBN: 9781642243383.
5. Lalitha B.S.,Sannagoudar M.S. & ReddyG.(2011). Enhancing Nutrient Use Efficiency: Concepts,Methods and Management Interventions. New India Publishing Agency (NIPA).
6. Cole G.(2017). Water Conservation and Management. Publisher: Larsen and Keller Education, ISBN-10 : 1635492882.
7. Magdoff F. and Van E. H. (2009). Building Soils for Better Crops, 3rd ed. Sustainable Agriculture research and Education (SARE).

PAPER-02. PLANT PROTECTION AND BIOPESTICIDES (CORE-04)
CR: 3+2

Plant protection- cultural, mechanical methods, botanical pesticides. Plant protection- botanical pesticides, bio-control agents, weed management weedicide, national and international standards for organic inputs- plant protection, disease and pest control by biopesticide of paddy, wheat, maize, pea, market available chemicals, application methods, principles of efficacy, pest and diseases of rice, vegetables and its control methods.

29.4.2022 29.04.2022 29/4 29.6.2022

PRACTICAL:

1. Comparative analysis of impact of cultural and mechanical plant protection practices.
2. Preparation of various types of botanical pesticide.
3. Application of pheromone traps and light traps.
4. Weed management practices by bio pesticide and chemical control analysis.
5. Application of herbicides in field and monitoring.

Suggested Readings:

1. Vincenzo V. (2017). Handbook of Pest Management in Organic Farming. Mediterranean University, Italy, Serge Kreiter, Montpellier SupAgro, France. Publisher: CABI, ISBN: 9781780644998.
2. Zadoks J. C.(2013). Crop Protection in Medieval Agriculture: Studies in pre-modern organic agriculture. ISBN: 9088901872, Publisher : Sidestone Press.
3. Teulon D.A. Plant Protection in Organic Arable and Vegetable Crops – a grower's resource. Publisher: New Zealand Institute for Crop & Food Research. ISBN 0 478 10843 5.
4. Roger B. Y. Organic plant protection: a comprehensive reference on controlling insects and diseases in the garden, orchard and yard without using chemicals / edited by and the editors of Organic gardening and farming magazine. Publisher: Emmaus, Pa.: Rodale Press. ISBN: 0878571108.

PAPER-03. FARM MACHINERY (GE-02) CR: 3+2

Introduction, aim and objectives, tillage; primary tillage equipment's, seedbed refining and leveling equipment, sowing and planting equipment, weeding and intercultural equipment, plant protection equipment, harvesting equipment's for cereals, threshing equipment, forage harvesting and residue handling, rice cultivation machinery, potato planter and harvester, equipments for sugarcane cultivation, estimation of operational cost.

PRACTICAL

1. Introduction to various farm machines and equipment used on the farm.
2. To Measure field efficiency of Farm implements.
3. Study of construction details, adjustments and working of plough.
4. Study of construction details, adjustments and working of disc plough.
5. Study of construction details, adjustments and working of cultivator.
6. Study of different type of mechanical paddy transplants.

29.4.2022 29.4.2022 29.4.2022 29.4.2022

7. Study of different weeding equipment and their uses.
8. Study of sprayers and measurement of nozzle discharge

Suggested readings:

1. Singh T. P. (2017). Farm Machinery. Publisher: PHI learning private limited.
2. Bell B. M. and Rickatson. (2015). Farm Machinery, 6th Edition. ISBN: 9781910456064, 1910456063
3. Kutz M. Handbook of Farm, Dairy and Food Machinery Engineering. ISBN: 9780128148037, Publisher: Elsevier Academic press.
4. Chen G. (2018). Advances in Agricultural Machinery and Technologies. Publisher: CRC Press, ISBN:9781351132381, 1351132385.

PAPER 4. ABILITY ENHANCEMENT COURSE (AEC-02) **CR: 2**
PAPER 5. SKILL ENHANCEMENT COURSE (SEC-02) **CR: 2**
PAPER 6. EXTRA CURRICULAR ACTIVITY (ECA-02) **CR: 2**

SEMESTER-III

PAPER-01. ORCHARD FARMING (CORE-05) CR: 3+2

Orchard management, importance, objectives, merits and demerits, clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches, tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shoot systems, biological efficiency of cropping systems in horticulture, systems of irrigation, soil management, integrated nutrient and pest management, utilization of resources constraints in existing systems, crop model and crop regulation in relation to cropping systems, status of organic horticulture national and international scenario, principles, practices, prospects of organic farming, technological advancements made in organic farming of fruits, Site selection, crop selection, soil preparation, soil solarisation, orchard management and mulching, establishment of orchard, high density and meadow orchad, planting and layout, organic crop production methods of plantation crops, mango, guava, coconut, arecanut, cashew, organic crop production methods- pineapple (*Ananas comosus*), banana, papaya.

29.4.2022 29.4.2022

PRACTICAL:

1. Site selection criteria with reference to types of crops
2. Land preparation and plantation techniques of plantation crops
3. Cultivation practices of mango and guava
4. Cultivation and management methods of papaya and banana
5. Marketing demand and supply analysis of the horticultural crops.

Suggested Readings:

1. Burrill, T. J. Orchard Cultivation. Publisher: Nabu Press, ISBN: 9781289619411
2. Singh H.P., George V. (2010). Thomas Organic Horticulture: Principles, Practices and Technologies Hardcover. Publisher: Westvill Publishing House, ISBN-10 : 8185873615.
2. Rateaver B. (1993). Organic method primer update: A practical explanation : the how and why for the beginner and the experience (Conservation gardening and farming) . Publishers: The Rateavers; ISBN-10 : 0915966018
3. Denckla T. C. (2003). The Gardener's A-Z Guide to Growing Organic Food. Publishers: Storey Publishing, LLC; Revised edition (January 1, 2003). ISBN-10 : 1580173705
4. Pathak R.K. & Ram, R. (2013). Manual on organic farming in Horticultural crops. 10.13140/2.1.1166.9761. https://www.researchgate.net/publication/265846481_Manual_on_organic_farming_in_Horticultural_crops
5. Chand G, Akhtar N., Kumar S.(2020). Diseases of Fruits and Vegetable Crops: Recent Management Approaches (Innovations in Horticultural Science). Publishers: Apple Academic Press; 1st edition (1 September 2020) ISBN-10 : 1771888369
6. Reddy P. P. (2012).Organic Farming for Sustainable Horticulture. Scientific Publishers, ASIN : B0783H6YRD

PAPER-02. ORGANIC FARMING AND BIOFERTILIZERS (CORE-06)

Concept of organic farming with the production of biofertilizer, biofertilizer's definition, scope, and potential microbes in organic farming, application of biofertilizer's, phosphorus solubilizing bio fertilizers, and microbial activities, biofertilizer formulations, scoping the use of transgenic microorganisms, quality control of biofertilizer, mycorrhizal fungi mass

29.4.2022 29.4.2022 29.4.2022

production guidelines to establish production unit, biofertilizer's industry and demand, case study on biofertilizer, prospects and challenges for future food utilization in sustainable agricultural, blue green algae, tools and instrument required for microbial production.

PRACTICAL

1. Visit to a biofertilizer production centre.
2. Staining- Simple and differential staining of bacteria. Simple staining – *Bacillussubtilis*, differential staining – *Bacillus* and *E-coli*.
3. Culture media preparation- Nutrient broth, nutrient agar slant, potato dextrose agar.
4. Preparation of various biofertilizer.
5. Marketing and survey for biofertilizer availability.

Suggested Readings:

1. Inamuddin, M., Imran A., Boddula R. And Rezakazemi M. (2021). Biofertilizers: Study and Impact Front Cover. Publisher: John Wiley & Sons. ISBN: 1119724678, 9781119724674.
2. Rakshit, A. Singh V. M., Parihar M., Singh, H. B., Singh A. K. (2021). Biofertilizers: Volume 1: Advances in Bio-inoculants. Publisher Elsevier Science, ISBN: 0128216670, 9780128216675
3. Purohit S. S. (2006). Microbiology Fundamentals and applications. Agrobios publication. ISBN- 9788177542592
4. Dubey R. C. and Maheshwari D. K. (2010). A text book of microbiology. S. Chand & Company Ltd. ISBN- 978-8121925594

PAPER-03. BASICS OF PLANT GENETICS AND PLANT BREEDING (CORE-07)
CR: 3+2

Plant cell: its structure and function. Cell reproduction, mitosis, meiosis and its significance. Nucleus chloroplast and mitochondria. Chromosome its structure and function. Chromosomal aberration. Polyploidy.Linkage and crossing over. Mendel's principles of heredity. Deviation from mendalian inheritance, pleiotropy, threshold characters, co-dominance, chromosome theory of inheritance, gene interaction, multiple alleles. Sex determination-theories, sex linked inheritance and characters. Cytoplasmic inheritance and maternal effects.Chemical basis of heredity. Structure of DNA and its replication, RNA:its structure and function. Mutation and its classification. Plant breeding its aim and objectives, modes of reproduction, methods of breeding, selection types and importance.

29.4.2022 29.4.2022

PRACTICAL

1. Preparation of slide showing various stages of mitosis.
2. Preparation of slides showing various stage of meiosis.
3. Testing the viability and germination of pollen grains.
4. Solving the problems based on Mendalian laws, floral morphology.

Suggested Readings:

1. Prasad G. (1998). Introduction to Cytogenetics. Kalyani publishers New Delhi, India
2. Singh P. (2005). Elementary of Genetics. Kalyani publishers Ludhiana, India
3. Acquaah G. (2012). Principles of Plant Genetics and Breeding, 2nd Edition. Wiley-Blackwell
4. Singh B. D. (2014). Fundamentals of Genetics. Kalyani Publishers
5. Gupta P. K. (2015). Cytology, Genetics and Evolution. Rastogi publications,Meerut, India.

PAPER.04. ORGANIC FARMING STARTUPS AND ENTREPRENEURSHIP (GE-03)

CR: 3+2

Organic products start-ups, scope and potential areas for start-ups, funding agencies, food processing and handling, entrepreneurship concept, characteristics, approaches, need for entrepreneurship, traits of an entrepreneur –risk taking, leadership, decision making, planning, organizing, coordinating and marketing, agri-enterprises- stages of establishing enterprise, project identification, step to be considered in setting up an enterprise, feasibility report, product selection, project management and appraisal: market, technical, social, financial analysis, *market management concept planning for marketing target, marketing and competitive strategy, types of entrepreneurs, challenges in organic farming.*

PRACTICAL

1. Industrial visits to learn food processing and handling methods
2. Interview of organic farming entrepreneurs to analyse the risk bearing capacity
3. Analysis of problems related to organic farming marketing with its solution
4. Conceptual project development on organic farming by the students
5. Project planning, appraisal and management analysis

Suggested Readings:

1. Kumar S. A., Poornima S. C., Abraham M. K. and Jayshree K. (2021). Entrepreneurship Development . Publisher: New Age Publishers, ISBN-10 : 8122414346

2. Wiswall R. (2009).The Organic Farmer's Business Handbook: A Complete Guide to Managing Finances, Crops, and Staff - and Making a Profit. Publishers: Chelsea Green Publishing; Pap/Cdr edition ASIN : B007EDZ2X6
3. Salatin J. (2013). You Can Farm: The Entrepeneur's Guide to Start & Succeed in a Farming Enterprise. Publishers: Polyface, Incorporated; ISBN-10 : 0963810928
4. Uwajeh A. N. Investments: The Easy Guide to Building Wealth with Agricultural Business for Beginners.Publishers: Kindle Edition. ASIN : B01LG5B0NS
5. Nuthall P. L. Farm Business Management: The Human Factor. Publishers: Lincoln University, New Zealand 9781789240733.
(https://www.cabi.org/bookshop/book/9781789240757/)

PAPER -05. ABILITY ENHANCEMENT COURSE (AEC-03) **CR: 2**

PAPER -6. EXTRA CURRICULAR ACTIVITY (ECA-03) **CR: 2**

SEMESTER IV

PAPER-01. BIODYNAMIC FARMING (CORE-08) CR: 3+2

Introduction, History, Principle and advantages, biodynamic preparation: crop rotation, Peppering, farm organism, weeds, pests and diseases, Converting a farm to biodynamic, cow horn manure and cow horn silica: preparation, storage and application, preparation, storage and application of jivaamrit, bijaamrit, plant based preparations, panchgavya preparation and application, dasakavya: preparation, storage and application.

PRACTICAL

1. Preparation of cow horn manure and cow horn silica.
2. Compost preparations through plant materials poison preparation, storage and application.
3. Dasagavya: preparation, storage and application.
4. Bijaamrit and jivaamrit preparation, storage and application methods

29.4.2022 29.04.2022 29.4.2022

Suggested Reading:

1. Selvaraj, N., AnitaB., Anusha B. and Saraswathi G. M. (2006). Organic Horticulture creating a more sustainable farming. Horticultural Research Station, Udhagamandalam.
2. Rudolf S. (2004). What is Biodynamics?Publisher SteinerBooks, 2004 ISBN: 0880109890
3. Waldin M. (2015).Biodynamic Gardening. Publisher: Dorling Kindersley Ltd, ISBN: 0241209331, 9780241209332
4. Masson V., Masson P. andBlais M. (2014). A Biodynamic Manual: Practical Instructions for Fanners and Gardeners.Publisher: Floris Books.ISBN-10: 1782500804

PAPER-02. CARBON NEUTRAL FARMING (CORE-09) CR: 3+2

Basic concept; meaning, objectives, scope- carbon neutral tools, carbon neutral initiatives, policy frame work related to carbon neutral farming, initiatives for carbon neutral farming climate neutral agricultural systems practice for increasing carbon in soils, efficient use of farm inputs assessment are identification low carbon emitting farming system, permanent crop farming, mixed farming, agroforestry and organic farming, case studies of carbon stable farming system in India and world, carbon farming business and enterprise.

PRACTICAL

1. Measurement of soil organic matter and soil organic carbon.
2. Measurement of GHG from different farming systems.
3. Measurement of carbon and nitrogen in farm inputs.
4. Determination of carbon stocks in soils of agricultural farms.

Suggested Readings:

1. Bansal M. Basics of organic farming.
2. EIP-AGRI workshop processing towards carbon neutral agriculture.
3. USDA report of carbon farming
4. Global carbon report on carbon reduction and offsets mulching activities effectively carbon neutral.
5. Reddy S. R. Farming system and sustainable agriculture.

29.4.2022 29.4.2022 29.4.2022 29.4.2022

6. Piccolo A. Carbon sequestration in agricultural soils.
7. Fraser R. C. A farmers guide to climate disruption.

PAPER-03. URBAN FARMING AND TERRACE GARDENING (CORE-10)

CR: 3+2

Introduction: concept, aim and significance, benefits; economic, environmental, organic container gardening, garden design, soil composition and soil texture, seed sowing and transplanting, features of organic fertilizers, principles of making liquid organic fertilizers, in house composting: organic matter, kitchen waste composting guidelines, soil management; general soil care, simple crop rotation plan, water and light management, pest management: organic foliar spray,roof and terrace gardening, ecosystem and working of a sustainable organic garden, soil, garden management and maintain, organic farming: a tool of good food good life, suitable crops for urban farming and terrace gardening yields and crop management practices.

PRACTICAL

1. Garden designing with available space.
2. Demonstration to container selection as per the different types of plants.
3. Soil preparation and preparation of potting mix.
4. Seed sowing methods.
5. Preparation of organic fertilizers with the help of kitchen waste.
6. Application of organic fertilizers as per plant requirement.
7. Management practices; pest, plant, soil and water.
8. Survey of urban kitchen gardening.

Suggested Readings:

1. Free e-book 'Organic Urban Farming The Indian Way
https://www.udemy.com/course/organic-container-gardening-the-indian-way/
2. George R.(2015). Container Gardening for Absolute Beginners. https://www.amazon.in/Organic-Container-Gardening-Absolute-Beginners-ebook/dp/B010XWRT1M
3. Upadhyaya T. (2021). Secrets of Terrace Gardening: A complete guide to setup and maintain your terrace garden in India, ISBN : 9355267274

29.4.2022 29.04.2022 19/ 29.4.22 SS Singh 29.4.2022

4. Latha A.M. (2016).Steps for starting a low budget organic vegetable Terrace gardenPublisher: green house India publisher, www.amazon.in
5. Toth . J (2014).Gardening: Urban Gardening: Growing Vegetables and Fruit in Heavily Populated Areaswww.amazon.in

PAPER-04. SOIL, WATER AND SEED TESTING (GE-04) CR: 3+2

Soil formation, physio-chemical properties of the soil and its significance, physical chemical properties of the water, water quality test, importance of water testing in agricultural practices, Seed formation, structure, types of seed, seed viability, dormancy, seedling growth parameters, Economically importance of seed testing, instruments for soil, water and plant testing analysis, nitrogen, phosphorus, potash, organic carbon in soil, hardness, nitrate, pH in water, tetrazolium seed viability test.

PRACTICAL

1. Estimation of available soil Potassium by flame photometer method.
2. Estimation of microbial biomass carbon.
3. Estimation of Nitrogen in plant sample.
4. Estimation of pH of Irrigation water.
5. Computation of quality parameters in Irrigation water.
6. Description of seed structures composition and economic importance.
7. Seed and soil health test.
8. Normal seedlings and abnormal seedlings.
9. Washing and cleaning of laboratory glass ware.
10. Equivalent weights and Molecular weights of some important chemical.
11. Unit of measurements and conversions.
12. Physical purity test, Determination of Seed Moisture.
13. Colour changes due to pH change in the presence of pH indicators

Suggested Readings:

1. Gurumurthy P. Practical Manual for Soil, Plant, Water and Seed Testing. Publisher Educreation Publishing.
2. Adepetu J. H. and Nahhan H. and Osinubi A.(1996).Simple soil, water and plant testing techniques for soil resource management. FAO.

29.4.2022 20 29.4.2022 29.4.2022

3. Singh D. (2015). Manual on Soil Plant and Water Analysis. Publisher: Westville Publishing House, ISBN-10: 8185873267.

4. Patiram B. (2020). Soil Testing and Analysis: Plant, Water And Pesticide Residues. Publisher : New India Publishing Agency- Nipa.ISBN-10 : 939017547X

PAPER -05. ABILITY ENHANCEMENT COURSE (AEC-04) **CR: 2**

SEMESTER V

PAPER-01. AGROFORESTRY (CORE-11) CR: 3+2

Indian agriculture- structure and constraints. Land use definition, classification and planning. Agroforestry- definition, aims objectives and need. Traditional Agroforestry systems: Taungya system, Shifting cultivation, Wind break, Shelterbelts, Homestead gardens. Alley cropping, high density short rotation plantation systems, silvicultural woodlots/energy plantations. Classification of agroforestry system-structural, Tree architecture, canopy management, Agroforestry systems in different agroclimatic zones, Tree-crop interface. Economics of agroforestry systems. People participation, rural entrepreneurship through agroforestry and industrial linkages.

PRACTICAL

1. Study characteristics of trees/shrubs/grasses for agroforestry.
2. Volume and biomass estimation.
3. Crown measurement, light interception and moisture measurement in agroforestry systems.
4. Litter estimation and nutrient analysis
5. Soil analysis, quantification of fertilizer doses,
6. Annual crops/grass growth measurements and yield

Suggested Readings:

1. Dwivedi A. P. (1992). Agroforestry principles and practices. Oxford and IBH Publication Co., New Delhi.
2. Chundawat D.S. and Gautam S. K. (2010). Textbook of agroforestry.Oxford and IBH publishing co pvt. Ltd.

29.4.2022 21 29.4.2022 29.04.2022

3. Nair P. K. R.(1993). An introduction to agroforestry. Kluwer Academic Publishers. 499 p.
4. Huxley P. (1999). Tropical agroforestry. Blackwell Science, Oxford. 371 p.
5. Ramakrishnan P. S. (1992). Shifting agriculture and sustainable development. Man and biosphere series. The Parthenon Publishing Group.

PAPER-02. FLORICULTURE (CORE-12) CR: 3+2

Floriculture: definition, component and importance, Nursery management practices, Identify Plant morphology, different plant varieties and plant families, poly house, net house, propagation techniques of flower, landscape garden, establishment of farm planning and layout different types of landscapes, mulching, planting system and planting densities. Integrated Organic Pest control management of floriculture. Use of growth regulators in horticulture, weed management, types of indoor gardening, Tree based cropping system, identify commercial flowers rose, gerbera, marigold and marketing, project preparation for commercial flowering plant.

PRACTICAL

1. Planning and layout of orchard, tools and implements,
2. Visit of commercial flower production unit.
3. Preparation of nursery beds for sowing of seeds.
4. Land preparation for flowering plants, planting system.
5. Preparation of organic fertilizer mixtures and field application.
6. Preparation and application of growth regulators, maturity standards, harvesting, grading, packaging and storage.

Suggested Readings:

1. Merlo G. (2018). Floriculture and Landscaping. Publisher: Scitus Academics LLC, ISBN 9781681179360
2. Kulkarni B. S. (2016). Floriculture and Landscaping. Agro India Publications
3. Singh J. (2007). Basic Horticulture. Kalyani publishers.
4. Singh A. K. (2020). Textbook of Floriculture And Landscaping. Publisher New India Publishing Agency- Nipa, ISBN; 9386546000.
5. Bal J. S. (2002). Fruit Growing in India. Kalyani publishers
6. Chadha K. L. (2015). Handbook of Horticulture. Jain book Agency.
7. Acquaah G. (2002). Horticulture - Principles and Practices.

29.4.2022 29.04.2022 29.4.2022

PAPER-03. RESIDUE MANAGEMENT PRACTICES AND MANURE PRODUCTION (CORE-13) CR: 3+2

Introduction Sources, composition and characterization of the solid waste, Economic consideration; Wastes as a wealth and source of income, Planning system, Valorization of organic solid waste, Recycling of organic wastes; Animal feed, composting, anaerobic digestion, rendering, rapid thermophilic digestion, Immobilized enzyme reaction, process, sanitary land filling, Energy recovery, manure production methods, Nadep compost, vermin-compost, Azola production.

PRACTICAL

1. Evaluation of the source of waste.
2. Categorization of wastes in different categories
3. Recycling of wastes in organic manure or any other useful materials
4. Case studies, Field visits, Economic valuation of waste management practices.
5. Venni compost production.
6. Litter decomposition of different plant species.

Suggested Readings:

1. Pichtel J. (2014). Waste Management Practices. Publisher; CRC press, ISBN; 9781000762648.
2. Sharma C.K.(2022). Solid, Liquid and Hazardous Waste Management. Publisher: Foundation Publishing House, ISBN-1:8195475590.
3. Tabassum B. (2016). Waste Management and Environmental Health. Publisher : Discovery Publishing House Pvt Ltd. ISBN-10 : 9350567776
4. Ramanathan A. L. and Jagbir Singh J. (2019). Solid Waste Management: Present and Future. Publisher: Dreamtech Press, ISBN-10: 9389447925
5. Waldrip, H. M. Pagliari, P. H. and He Z. (2020). Animal Manure: Production, Characteristics, Environmental Concerns, and Management, Volume 67 Print ISBN:9780891183709.

29.4.2022 29.04.2022 23 29.4.2022

PAPER-04. CLIMATOLOGY AND METEOROLOGY (DSE-1) **CR: 3 + 2**

Introduction the atmosphere: origin, composition and structure, isolation and heat budget temperature of the atmosphere, distribution of temperature, air pressure and winds, general circulation of the atmosphere, monsoon, winds, humidity, fog and clouds, precipitation, atmosphere equilibrium: stability and instability, air masses, classification of climate, distribution, climate Change, weather forecasting and analysis, applied climatology, global warming, meteorology: weather and climate, micro-climate, weather elements,solar radiation, nature, properties, solar constant and energy balance, introduction to monsoon, basics of weather forecasting.

PRACTICAL

1. Site selection for agromet observatory, measurement of temperature, measurement of rainfall, measurement of evaporation, measurement of atmospheric pressure, measurement of sunshine duration and solar radiation.
2. Measurement of wind direction and speed and relative humidity.
3. Study of weather forecasting and synoptic chart.
4. Field visits to observe changing pattern adopted by farmer for agriculture due to climate change.

Suggested Readings:

1. Lal D.S. (2011). Climatology. Publisher: Sharda Pustak Bhawan, ISBN-10 : 8186204121
2. Ghadekar S.R. (2008). Textbook of Agro-meteorology. Agromet publishers.
3. Norman D. D. and Malcolm (2007). Farming Systems Development and Soil Conservation FAO. Jain Book Agency.
4. Khan M. K. and Ajmal A. (2008). Crop andforage production using saline waters nam S&T Centre. Jain Book Agency.
5. Singh C. (2012). Modern techniques of raising field crops.Oxford and IBH publishing company, New Delhi.
6. Varshnaya M. C. and Pillai B. (2012). A textbook of agriculture metrology. ICAR, New Delhi Publications.

OR

29.4.2022 29.04.2022 24 29.4.2022

SERICULTURE TECHNOLOGY (DSE-01) **CR: 3+2**

Introduction, scope and principle of Sericulture, Silk production in India and other countries and their export and import, types of silk produced in India; host plants of mulberry and non-mulberry silkworms, classification of sericigenous insects. Classification of silkworms based on moultinism, voltinism and geographical distribution; popular silkworm breeds and hybrids of Chhattisgarh, silkworm morphology, silkworm rearing methods, silkworm pest and diseases. Preparation of nursery beds, Selection of materials for cuttings, selection of cutting planting. Selection and grading of sampling, planting System and intercultural operations; - characteristics of sericulture industry, silk reeling, handloom and power loom activities, role of state sericulture department, Central Silk Board, prospects and problems of Sericulture industry for livelihood.

PRACTICAL

1. Sericulture World maps and map of India and Chhattisgarh.
2. Study of life cycle of silkworm: Morphology of egg, larva, pupa and adult. Cocoon characters of popular uni-, bi- and multivoltine races,
3. Identification of different diseased silkworms based on external symptoms.
4. Morphological study of few important cultivars in Chhattisgarh.
5. Preparation of grafting (bud or shoot grafting) or layering (simple layering) drawing and labelling.
6. Identification of different types of weeds, fertilizers, calculation of dosages. Preparation Compost.

Suggested Readings:

1. Kim H. B. (1989). Filature water engineering, Seoul national university press, Republic of Korea.
2. Huang G. R. (1988). Silk reeling, Oxford and IBH publishing co. Pvt. New Delhi.
3. Mahadeveppa D. Halliyal, V.G., Shankar, A.G. And Bhandiwad, R. (2000). Mulberry Silk Reeling Technology, Oxford And IBH Publishing Co. Pvt. Ltd. New Delhi.
4. SonwalkerT. N. (2010). Handbook of Silk Technology, New Age International Pvt., Ltd.
5. Lee Y. W. (1999). Silk Reeling And Testing Manual, FAO Agricultural Services Bulletin No. 136, Rome, Italy.

29.4.2022 29.04.2022 29.4.2022

6. Akira Nakamura (2000). Fiber Science and Technology. Oxford & IBH Publications, New Delhi.

SEMESTER-VI

PAPER-01. VEGETABLE FARMING (CORE-14) CR 3+2

Introduction to vegetable growing, cultural practices for vegetables, export and import of vegetables, explain general cultural practices used for vegetable production, crop rotation, soils, plant foods, cover crops, cultivation techniques, seed, hybrid seed, storing seed, sowing seed, understanding soils, dealing with soil problems, plant nutrition and feeding, pest, disease & weed control, hydroponic, aeroponic and greenhouse growing, growing selected vegetable varieties, irrigation, harvest & post-harvest, marketing of vegetables, vegetable production methods- okra, amaranthus, cauliflower, cabbage, tomato, solanaceous, cucurbits, spices- pepper, ginger, turmeric, *Amorphophallus paeoniifolius*, drumstick (*Moringa oleifera L.*).

PRACTICAL

1.Site selection and preparation.

2. Cultural practices of cover crops.

3. Planting Vegetables -seed, hybrid seed, storing seed, sowing seed.

4. Cultivation practices of vegetables as per their requirements and plant nutrition management.

6. Pest and weed management practices.

7. Storage and marketing process of vegetables.

Suggested Readings:

1. Jeavons J. and Leler R.(1979). How to Grow More Vegetables. Publisher: Ten Speed Press, ISBN-10 : 0913668990.

2. Coleman E. (2018). The New Organic Grower. Publisher: Chelsea Green Publishing, ISBN-10 : 1603588175.

3. Sowards J. (2021). The First-Time Gardener: Growing Vegetables. Publisher : Cool Springs Press, ISBN-10 : 0760368724.

29.4.2022 26 29.4.2022

19.04.2022

4. Matt Rees-Warren M. (2022). Book Review: The Ecological Gardener. https://www.sustainablemarketfarming.com/

PAPER-02. MEDICINAL PLANT & AROMETIC PLANT FARMING (CORE-15)
CR: 3+2

Medicinal diversity in India, Indian Traditional knowledge on medicinal plants: history, scopes, opportunities, Merits and demerits of using herbal products, important medicinal plants viz. *Pepper, Cardamom, Rauwolfia serpentina, Withania somnifera, Dioscorea, Baladona, Cinchona, Citronellagrass,* khus grass (Vetiver), *Mentha,* Sweet flag (butch), *Ocimum,* Safedmusli, Giloy, soil and climate requirements, export and import potential of medicinal plants, cultivation techniques, value addition and processing techniques,medicinal/herbal garden, National Medicinal Plant Development Board, Medicinal plant conservation area (MPCA).

PRACTICAL

1. Identification of different medicinal and aromatic plants.
2. Collection and processing of medicinal and aromatic plants, processing techniques, storage, packaging.
3. Visit of MPCA, forest area.
4. Application of locally available medicinal plants, interaction with Vaidya and local healers.

Suggested readings:

1. Amritpal Singh Saroya (2018). Textbook of Medicinal and Aromatic Plants. Indian Council of Agriculture Research, New Delhi.
2. Anand Singh Bisht (2019). Hand Book of Medicinal and Aromatic Crops, Brillion Publishing House, New Delhi.
3. N Deepa Devi (2017). A Text Book of Medicinal and Aromatic Crops. Aavishkar Publishers, Distributors, Jaipur

29.4.2022 29.4.2022 29.4.2022

PAPER-03. HARVESTING ORGANIC PRODUCE, QUALITY ANALYSIS AND IMPROVEMENT (DSE-02) **CR: 3+2**

Harvesting technology; operations – digging, lifting, winnowing, stocking and threshing, timing of harvest, methods of harvest, special techniques, yield collection and management, planning for postharvest quality, crop quality indicators, crop rotation, intercropping, designing cropping system, criteria for seed evaluation, characterization and multiplication, importance of traditional varieties, management of crop purity.

PRACTICAL

1. Harvesting operations digging, lifting, winnowing, stocking and threshing
2. Analysis of crop yield and management.
3. Post harvest techniques of quality management of crops.
4. Crop quality indicators to predict the productivity of soil.

Suggested Reading:

1. Thompson and A. K . (2014) Fruit And Vegetables: Harvesting, Handling And Storage, 2 Volume, Publisher: John Wiley, ISBN: 9781118654040
2. Organic Materials Review Institute, http://www.omri.org/
3. Charles D.J.(2004). Handbook of Herbs and Spices, Volume 2
4. Munnaf M.A. and Mouazen A.M.(2020). Advances in Agronomy.
5. https://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Compilation_techniques_organic_agriculture_rev.pdf

OR

POST-HARVEST MANAGEMENT AND VALUE ADDITION (DSE-02) **CR: 3+2**

Post-harvesting management and its Importance, status of food processing in India, concept of safe food and important food regulations in India, harvesting and post-harvest handling of organic crops, fruits and vegetables ripening process, fruits and vegetables, factors affecting the quality of the post-harvest life and deterioration of harvested crops. Principles and methods of food processing and preservation and its benefits. Methods of storage-pre cooling, pre-storage treatments, low-temperature storage ,controlled atmosphere storage, hypobaric storage, irradiation, and low-cost storage structures, packaging technology.

29.4.2022 28 29.04.2022 29.04.2022

PRACTICAL

1. Visit of Mart for identification of different value-added products.
2. Preparation of Pickles, Jam, Jelly, ketchup and Morabba.
3. Drying of fruits, vegetables and flowers.
4. Identification of fresh and aged vegetables and fruits.
5. Visit to cold storage for recording the protocols storage of various fruits and vegetables.
6. Visit to a flower Mandi and record the activities in the Mandi.
7. Visit to a local fruit market and record the activities in the market.

Suggested books

1. Goel K. A., Kumar R. and Mann S. S. (2007). Postharvest Management and Value Addition. *Daya Publishing House*. ISBN- 978-8170354543
2. Rathore N. S., Mathur G. K. and Chasta S.S. (2012). Post-Harvest Management and Processing of Fruits and Vegetables. *The Energy and Resources Institute*. ISBN- 978-8171641154
3. Simson S. P. &Straus M.C. (2010). Post-Harvest Technology of Horticultural Crops. *Oxford*. ISBN- 978-9380179254
4. Kumar P. V. S.& Sudha Vani V. (2020). Post-Harvest Handling and Processing of Plantation Crops. *Notion Press*. ISBN- 9781648501289
5. Arya M. A., Kumar T. and Chandra S.(2020). Practical Manual on Post Harvest Management and Value Addition of Fruits and Vegetables. *Jain Brothers*. ISBN- 978-8194413745

PAPER -04. ABILITY ENHANCEMENT COURSE (AEC-05) **CR: 2**

PAPER-05. MOOC COURSE **CR:2-4**

SEMESTER VII

PAPER: 1. BIOSTATISTICS (CORE-16) **CR: 3 + 2**

Definition and application of statistics, types and source of data, classification and tabulation of data, frequency, distribution, graphical representation of data, (Bar diagram, pie chart, histogram, frequency polygon) measures of central tendency (mean, median, mode) measures of Dispersion (range, standard deviation, Mean deviation, Quartile deviation,

29

29.4.2022

29.4.2022

29.4.2022

variance, coefficient of variation), Probability, Test of signification: basic concepts,(Z- Test, X^2-Test, t-Test, F-test,), regression, correlation : (scatter diagram, correlation co-efficient, its properties).

PRACTICAL

1. Histogram, frequency polygon, Bar chart, pie chart.
2. Measures of central tendency: Mean median and mode for raw and grouped data.
3. Construction of frequency distribution table and its graphical representation.
4. Measures of dispersion: Range, mean deviation, quartile deviation and standard deviation for raw and grouped data.
5. Paired 't' test, Chi-square test for contingency tables and theoretical ratios
6. Correlation and linear regression.

Suggested Readings:

1. Kenneth N. B. (1998). Introductory Statistics.www.amazon.com
2. Arora P. N. (2003). Biostatistics. Himalayan publishers.
3. Pagano M. and Gauvreau K. (2008). Principles of Biostatistics.Jhon and Wiley Sons Ltd.
4. Chandel S. R. S. (2009). A Hand Book of Agricultural Statistics. Publisher: Anchal Prakhan Mandir.

PAPER-02. GENETIC ENGINEERING AND TRANSGENIC PLANTS (CORE-17)

CR: 3+2

Introduction to genetic engineering, scope of genetic engineering; restriction enzymes and DNA Modifying enzymes, Gene Cloning vectors, gene expression; basics of gene expression various recombinant DNA techniques and their applications, genetically modified (GM) crop plants developed by recombinant DNA (rDNA), genetically modified organisms (GMO), new genetic modification techniques (nGMs), transgenic technology principles of transgene technology, scope of transgenetic technology, gene tagging (T-DNA) tagging and transposon tagging) in gene analysis (identification and isolation of gene), transgenic and gene knockouts technologies - targeted gene replacement, chromosome engineering, gene therapy, strategies of gene delivery, gene replacement/ augmentation, gene correction, gene editing and silencing, transgenic plants.

PRACTICAL

1. Isolation of DNA from plant tissue

29.4.2022 30 29/4 29.4.2022 29.4.2022

2. Isolation of DNA from animal tissue

3. Agarose gel electrophoresis

4. Effects of antibiotics by gradient method

5. UV induced metagenesis

Suggested readings:

1. Singh G. D. Genetics Engineering of Plants. Publisher: Anmol Publications Pvt Ltd. ISBN: 9788126135998, 9788126135998.
2. Dodds J. H. (2012).Plant Genetic Engineering. Publisher : Cambridge University Press. ISBN-10 : 1107404576, ISBN-13 : 978-1107404571
3. Govil C.M., Aggarwal A. and Sharma J. Plant Biotechnology and Genetic Engineering. Publisher: PHI Learning, ISBN: 9788120353145, 9788120353145.
4. Kumar S., Barone, P. and M. S. (2019).Transgenic Plants. Publisher: Springer Link, ISBN: 978-1-4939-8778-8.
5. T.A.Brown T. A. (2010). Gene Cloning and DNA Analysis, An Introduction. Publiction: Wiley –Blackwell, publication.
6. Primrose, S. B. and Richard M. T. (2009). Principles of Gene Manipulation and Genomics, , Publication; Blackwell Scientific.

PAPER-03. ORGANIC CERTIFICATION (CORE-18) CR: 3+2

Farm economy: basic concept of economics- demand, supply, economic, viability of a farm. Basic production principles, reducing expenses, ways to increase returns, cost of production system, benefit/ cost ratio, marketing, imports and exports,policies and incentives of organic production, farm inspection and certification: conversion to organic farming, organic earning and national economy, socio economic impacts, procedure of certification of organic products, geo-tagging.

PRACTICAL

1. Estimation of the relationship between demand of supply of organic farm produces
2. Estimation of revenue of farm produces
3. Calculate the cost benefit ratio of organic farming
4. Marketing channels of import and export of organic produces
5. Organic certification process with implementation of policies
6. Socio economic impact assessment with adaptation of organic farming
7. Field visit for Apiculture, Mushroom production, Terrace farming

29.4.2022 31 29/4 29.4.2022 29.04.2022

Suggested Reading:

1. Gehlot D. (2005). Organic Farming: Standard Accreditation Certification and Inspection. Publishers: Agrobios, ISBN-10: 9788177542370.
2. Ogunbanwo S. A. (2012). Organic Certification for Livelihoods Improvement Paperback – Import. Publishers: LAP Lambert Academic Publishing. ISBN-10 : 9783848416332.
3. Vijayan G. (2014). Organic Food Certification and Marketing Strategies. Publishers: AGRIHORTICO ASIN : B00HZI59ZG
4. Yadav A K. Training Manual Certification and Inspection Systems in Organic Farming in India. Government of India Ministry of Agriculture Department of Agriculture and Cooperation. Publishers: National Centre of Organic Farming CGO-II, Kamla Nehru Nagar, Ghaziabad, UP – 201 002.

PAPER-04.MUSHROOM TECHNOLOGY (DSE-03) CR: 3+2

Introduction to mushroom technology; biology of mushrooms; nutritional value, medicinal value of mushrooms, edible mushrooms and cultivation status in India and world, cultivation technology: infrastructure, equipment and substrates in mushroom cultivation, spawn: types, preparation, mushroom bed preparation and factors affecting, compost technology in mushroom production, casing; raw material used for casing, preparation of casing material; important sanitation cultivation, insect - pests management in cultivated mushroom, disease management in cultivated mushroom, value addition of mushroom.

PRACTICAL:

1. Identification of local mushroom Flora and preserved specimens of mushroom.
2. Sterilization of glasswares, equipment, and culture media used in mushroom cultivation.
3. Preparation of culture media: Potato Dextrose medium, Richards medium.
4. Preparation of spawn: Grain spawn, Straw spawn, Sawdust spawn.
5. Preparation of compost and known compost formulations.
6. Identification and management of pests, diseases in Mushroom cultivation.

Suggested Readings:

1. Bahl N.(2008). Handbook on Mushrooms. Publisher: Oxford & IBH publishing Company. ISBN: 9788120413993.

29.4.2022 32 29.4.2022 29.04.2022

2. Revathy N.(2020). Mushroom Cultivation. Publisher: Shanlax Publications. ISBN: 978939082735
3. Rana R. S.(2020). Mushroom Cultivation and its Diseases. Publisher: Sankalp Publication. ISBN: 9788194717607

OR

APICULTURE TECHNOLOGY (DSE-03) **CR: 3+2**

Introduction to Apiculture - scope, importance; Apiculture development in India - institutions involved; Species of Honey bees - indigenous, exotic - morphology; Honey - its medicinal properties - application in various fields - other valuable products of honey bees, Bee keeping equipment - introduction to types of bee boxes - BIS standard Tools used in apiculture; Bee flora - importance and rearing - congenial conditions for starting up of apiculture; Honey extraction & handling - Quality control standards - Honey testing kit - Processing of honey; Diseases of Honey Bees - Preventive & Control measures.

PRACTICAL:

1. To study the morphology of local Honey Bee species and their life cycle.
2. To study the detail of honey extraction procedures and quality assessment of Honey samples obtained from local marketing areas.
3. Identification of Bee Flora, their rearing and other importance.
4. To study various Bee keeping equipment's with well labelled diagrams.

Suggested Readings:

1. Mishra R. C. (2013).Prospective in Indian Apiculture. Publisher: Agrobios Publication. ISBN: 9788177541311
2. Nagaraja N. (2014). Honeybees. Publisher: MJP Publishers. ISBN: 9788180940590
3. Mishra R. C. (2013). Honeybees and Their Management in India. Publisher: ICAR, New Delhi. ISBN: 9788171641475

1. **SEMINAR (S1)/ EXPERIMENTAL LEARNING CR: 2**

SEMESTER - VIII

PAPER 1. FARMING OPERATIONS WORK EXPERIENCE (INTR -1)

CR: 06

29.4.2022

33

29.4.2022

29.04.2022

Visit to Hi-Tech Nursery, green house, Herbal garden and watersheds. Adopted traditional and modern farming pattern by the villages and crop production. Soil type and adopted cropping pattern and yield calculation. Study the CAT (Catchment area treatment) plan. Use of agricultural farming equipment's instruments. Study the marketing and management of important crops. Methods adopted for the organic manure production.

PAPER 2. INSTITUTES AND INDUSTRIAL VISIT/ TRAINING (INTR-2)

CR: 06

Study the nature of agricultural/ organic product based industries. Raw material- Collection and processing of raw material. Production and management process. Marketing and financial management. Visits of nearby institutions/ organizations.

PAPER 3. DISSERTION **CR: 06**

Students select any topic of research, case study, review of literatures, field study, and experiment on organic farming/ agriculture crop production. Supervisor/ Mentors will be allotted to supervise and guide the students for the dissertation work.

29.4.2022

29.04.2022

29/4

29.4.2022

Department : ***Department of Forestry, Wildlife & Environmental Sciences***

Programme Name : ***B. Sc. Forestry***

Academic Year : 2022-23

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
1.	FOUATA1	Ability Enhancement Course
2.	FOUATL1	Skill Enhancement Course
3.	FOUATS2	Physical Education
4.	FOUBTA2	Ability Enhancement Course
5.	FOUBTL2	Skill Enhancement Course
6.	FOUBTS4	Physical Education
7.	FOUCTG3	Non timber Forest Products and Ethnoforestry
8.	FOUCTA3	Ability Enhancement Course
9.	FOUDTG4	Sericulture
10.	FOUDTA4	Ability Enhancement Course
11.	FOUETT11	Watershed and its Management
12.	FOUFTD2	Urbon Forestry
13.	FOUFTD2	Land Degradation and Restoration
14.	FOUFTA5	Ability Enhancement Course
15.		Online MOOC Course
16.	FOUGSS2	Seminar
17.	FOUHDF1	Dissertation

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2021-22

School : *Natural Resources*

Department : *Forestry, Wildlife and Environmental Sciences*

Date and Time : *December 23, 2021 – 11:30 AM*

Venue : *Smart Class Room*

The scheduled meeting of member of Board of Studies (BoS) of Department Forestry, Wildlife and Environmental Sciences, School of Studies of Natural Resources, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Sc. (Forestry) 4 Years (8 semester) scheme and syllabi.

The following members were present in the meeting:

1. Prof. A.K. Singh (External Expert Member BoS, Dept. of Genetics and Plant Breeding, College of Agriculture, Pant Nagar)
2. Prof. S S Singh (Member BoS, Dept. Forestry, Wildlife and Environmental Sciences)
3. Dr. Dr. S.C. Tiwari (HOD, Associate Prof., Dept. Forestry, Wildlife and Environmental Sciences , Chairman, BOS)
4. Dr. K.K. Chandra (Member BoS, Associate Professor, Dept. Forestry, Wildlife and Environmental Sciences)
5. Dr. Gunjan Patil (Member, Assistant Professor, Dept. Forestry, Wildlife and Environmental Sciences)

Following points were discussed during the meeting

1. Revised LOCF ordinance of B. Sc. (Forestry) Four Years (8 Semester) degree program.
2. LOCF/ECS scheme is implemented in any of the program of B. Sc. (Forestry) Four Years (8 Semester) degree program.
3. The BoS has approved the CBCS Course curriculum and ordinance of B. Sc. (Forestry) Four Years (8 Semester) degree program with effect from academic session 2021-22.

विभागाध्यक्ष
Head
वानिकी, वन्यजीव एवं पर्यावरण विभाग
Department of Forestry, Wildlife and Environmental Science
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (LOCF)

FOR

B.Sc. FORESTRY

(w.e.f. Academic session:2021-22)

"SCHOOL OF NATURAL RESOURCES"

DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCES

GURU GHASIDAS VISHWAVIDYALAYA

(A Central University established by the Central University Act.2009 No. 25 of 2009)

BILASPUR-495009, CHHATTISGARH

23.12.2021

23/12/2021

Course Structure and Credit Distribution

B.Sc. Forestry (4 -Year / 8- Semester) LOCF based Program

Semester	Course Opted	Course Code	Name of the course	Credit	Hour / week	Marks
I	Core-01	FOUATT1	Principles and Practice of Silviculture	3	3	100
	Core-01 Practical	FOUALT1		2	3	100
	Core-02	FOUATT2	Fundamentals of Soil Science	3	3	100
	Core-02 Practical	FOUALT2		2	3	100
	Generic Elective (GE)-01	FOUATG1	Basic Mathematics	4	4	100
	Seminar/ Tutorial	FOUASS1		1	1	100
	Ability Enhancement Course (AEC-01)	FOUATA1	Drawn from the University Pool	2	...	100
	Skill Enhancement Course(SEC-01)	FOUATL1	Drawn From the University pool	2	..	100
	Extracurricular Activity-(ECA-01) *Additional Credit Course (Non-Mandatory)	FOUATS1	ECA-Extra-curricular activity (Field visit/ NSS/NCC/ *Swachhta/* / Plantation Activities)	2		100
	Physical Education	FOUAT82	Non Credit	----	2	100
	TOTAL			**19**	**19**	**1000**
II	Core -03	FOUBTT3	Forest Mensuration	3	3	100
	Core -03 Practical	FOUBLT3		2	3	100
	Core -04	FOUBTT4	Cytogenetic s and Plant Breeding	3	3	100

23/12/2021

23.12.2021

	Core -04 Practical	FOUBLT4		2	3	100
	Generic Elective (GE)-02	FOUBTG2	Forest Botany and Dendrology	3	3	100
	Generic Elective (GE)-02 Practical	FOUBLG2		2	3	100
	Ability Enhancement Compulsory (AEC-02)	FOUBTA2	Drawn from the university pool	2	2	100
	Skill Enhancement Course(SEC-02)	FOUBTL2	Drawn From the University pool	2	..	100
	Extracurricular Activity-(ECA-02) *Additional Credit Course (Non Mandatory)	FOUBTS3	ECA-Extracurricular activity(Field visit/ NSS/ Swachhta/ vocational Training/ Plantation activities)	2	..	100
	Physical Education	FOUBTS4	Non Credit	----	2	100
	TOTAL			19	22	900

Semester	Course Opted	Course Code	Name of the course	Credit	Hour / weak	Marks
III	Core -05	FOUCTT5	Forest Ecology and Biodiversity Conservation	3	3	100
	Core -05 Practical	FOUCLT5		2	3	100
	Core -06	FOUCTT6	Fundamentals of Wildlife and its Management	3	3	100
	Core -06 Practical	FOUCLT6		2	3	100
	Core -07	FOUCTT7	Forest Management	3	3	100
	Core -07 Practical	FOUCLT7		2	3	100
	Generic Elective-(GE)-03	FOUCTG3	Non Timber Forest Products and Ethnoforestry	3	3	100
	Generic Elective (GE-3) Practical	FOUCLG3		2	3	100

23.12.2024

	Core -13	FOUETT13	Forest Tree Seed Technology	3	3	100
	Core -13 Practical	FOUELT13		2	3	100
	Discipline Specific Elective DSE-1	FOUETD1	Meteorology and Crop Production	3	3	100
	Practical	FOUELD1		2	3	100
			Basic Concept of Horticultural and Landscaping			
	TOTAL			**20**	**24**	**800**
VI	Core -14	FOUFTT14	Forest Pathology and Entomology	3	3	100
	Core -14 Practical	FOUFLT14		2	3	100
	Core -15	FOUFTT15	Agroforestry and Tree Outside Forests	3	3	100
	Core -15 Practical	FOUFLT15		2	3	100
	Core -16	FOUFTT16	Forest Economics	3	3	100
	Core -16 Practical	FOUFLT16		2	3	100
	Discipline Specific Elective-(DSE-2)	FOUFTD2	Urban Forestry	3	3	100
	Practical	FOUFLD2		2	3	100
			Land Degradation and Restoration			
	Ability Enhancement Course (AEC-05)	FOUFTA5	Drawn from the University Pool	2	...	100
	MOOC Course (01)		Online MOOC Course	2	...	...
	TOTAL			**24**	**24**	**900**
VII	Core -17	FOUGTT17	Biostatistics	3	3	100
	Core -17 Practical	FOUGLT17		2	3	100

	Core -18	FOUGTT18	Forest Policy, Legislation and Environmental Act	3	3	100
	Core -18 Practical	FOUGLT18		2	3	100
	Core -19	FOUGTT19	World Forestry Systems and Climate Change Mitigation	3	3	100
	Core -19 Practical	FOUGLT19		2	3	100
	Discipline Specific Elective-(DSE-3)	FOUGTD3	Forestry Extension	3	3	100
	Practical	FOUGLD3		2	3	100
			Entrepreneurship Development			
	Seminar	FOUGSS2	Seminar	2	2	100
	TOTAL			22	26	900
VIII	INTR -1	FOUHEF1	Socio- economic Survey-Village attachment (Report Writing, Presentation, Viva-Voce)			200
	INTR – 2	FOUHEF2	Forest operation Work Experience (Report Writing, Presentation, Viva-Voce)			200
	INTR – 3	FOUHEF3	Forest Institute and Industrial visit (Report Writing, Presentation, Viva-Voce)			200
	Dissertation	FOUHDF1	Report Evaluation, Presentation, Viva-Voce			100
	The nature of the course in VIII Semester is field based. Socio- economic survey will be performed by the students in an assigned village. For exposure of forest operational work students will be attached with State Forest Department. Institute/ industrial training will be accomplished by the students through visits of nearby forest based Industries / Institutions.					
	TOTAL		22 (6 credits for each Training and 4 credits for Dissertation segment)	48 Hours/ week for each Training segment separately		700
	GRAND TOTAL		170			7000

23.12.2024

PAPER 4. NON WOOD FOREST PRODUCTS AND ETHNOFORESTRY

(GE-03) **CR: 3+2**

Forest and tribes- their relationship, Major tribes in India and Chhattisgarh. Forest ecosystem and cottage industries. Role of tribes in forest protection, development and conservation. Tribal welfare and social forestry, Tribal and co-operative movements. History of tribal welfare and administration, forest & tribes, Seed and biofuels, Herbal medicines in ethno-medical practices, Edible wild fruits, Wild mushrooms, Natural dyes, Economic uses of grasses. Gums and resins, important gum yielding plants. Resins and Oleoresins, their formation in plants and its uses, Sericulture and lac culture Tendu leaves– sources, collection and processing. Dependency of forest dwellers on NTFP in economy Scenario of NTFP obtained from forests of Chhattisgarh (Central India). Ethnoforestry & sustainable management.

PRACTICAL

Morphological description and identification of various medicinal plants .Collection of medicinal plants and plants part from natural habitats. Survey and study of nursery techniques of medicinal plants. . Visit to Herbal Gardens and herbaria to study medicinal plants.. Visit to nearby MPCA/ nursery/ ayurvedic pharmacies. Study the tribal races of India. Study the important medicinal plant used by traditional healers. Visit to nearby forests to study important NTFP yielding plants. Study of canes and bamboos and their sources. Study of gums and resins and their Visit of sericulture and lac cultivation farms. Tendupatta area and interaction with forest dwellers to study the economy of rural people.

Suggested Readings:

Ashok Ranjan Basu & S. Nijhavan (1985) Tribal Development Administration in India. Mittal publications.

C.M. Cottan (1996) Ethno botany: Principles &Applications. Jhon Wiley and sons Ltd.

Dwivedi, A.P. (1993) Forests - the non-wood resources. International Book Distributor, Dehradun. 352 p.

Mehta T (2012) A handbook of forest utilization. Today and Tomorrow publishers.

R.K. Sinha (1996) Ethnobotany: the renaissance of Traditional Herbal Medicines. Inashree publishers.

Taank P (2010) Forest product and their utilization. Today and Tomorrow publishers.

V.P. Agrawal (2002) Forest in India. Oxford and IBH publishers.

Vinod M. Mhaiske, Vinayak K Patila and Satish S Narkhede (2016). Forest Tribology and Anthropology. Scientific Publishers, Delhi.

PAPER 4: SERICULTURE (GE-04) New CR: 3+2

Introduction, scope and principle of Sericulture. Mulberry and non-mulberry sericulture in India; Silk production in India and other countries and their export and import. Insect and non-insect fauna producing silk; types of silk produced in India; host plants of mulberry and non-mulberry silkworms; mulberry cultivars – tropical and temperate regions, irrigated and rainfed conditions. Characteristic features of the order Lepidoptera; Classification of sericigenous insects. Classification of silkworms based on moultinism, voltinism and geographical distribution; popular silkworm breeds and hybrids of Chhattisgarh, their economic traits. Silkworm morphology, Silkworm rearing methods, Silkworm pest and diseases. Preparation of nursery beds, Selection of materials for cuttings, selection of cutting planting. Selection and grading of sampling. Different propagation methods of silk plant host– grafting and layering. Planting System and Intercultural Operations: - pit and row system, mulching, irrigation. Characteristics of sericulture industry: Land and agro based part of industry. Silk reeling as a cottage industry; Handloom and power loom activities. Textile fibers: Natural and Synthetic fibers: Advantage of silk fiber over other fibers. Sericulture organizations in India and Chhattisgarh; role of State Sericulture department, Central Silk Board. Prospects and problems of Sericulture industry.

PRACTICAL

Sericulture World maps and Silk Road, Sericulture map of India and Chhattisgarh, Study of life cycle of silkworm: Morphology of egg, larva, pupa and adult. Cocoon characters of popular uni-, bi- and multivoltine races, Identification of different diseased silkworms based on external symptoms. Identification and uses of two sericulture rearing appliances. Calculate the brushing capacity in accordance to leaf estimation/acre. Morphological study of few important cultivars in Chhattisgarh. Preparation of grafting (bud or shoot grafting) or layering (simple layering) drawing and labelling. Identification of different types of weeds, fertilizers, calculation of dosages. Preparation Compost.

Suggested Readings:

Byong Ho Kim (1989). Filature water engineering, Seoul national university press, Republic of Korea.

23.12.24 23/12/2024

SEMESTER – I

PAPER 1. WATERSHED AND ITS MANAGEMENT (Core-11) CR: 3+2 New

Watershed - introduction and characteristics. Problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio-economic factors. Watershed management - concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologic data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index. Water budgeting in a watershed. Rainwater conservation technologies, inter-terrace and inter-bund land management. Integrated watershed management - concept, components, arable lands and non-arable lands. Effect of land management on watershed hydrology. Participatory watershed management, Application of Remote Sensing, GIS & Isolope technology in survey and problem identification for planning and management of watershed.

PRACTICAL

Exercises on delineation of watersheds using topo-sheets. Surveying and preparation of watershed map. Quantitative analysis of watershed characteristics and parameters. Watershed investigations for planning and development. Analysis of hydrologic data for planning watershed management. Water budgeting of watersheds. Prioritization of watersheds based on sediment yield index. Study of functional requirement of watershed development structures. Study of watershed management technologies. Practice on software for analysis of hydrologic parameters of watershed. Study of role of various functionaries in watershed development programmes. Techno-economic viability analysis of watershed projects. Visit to watershed development project areas.

Suggested Readings:

S. K. Datta (1985). Soil Conservation and Land Management. International Book Distributors, Dehradun

23.12.24

23/12/2024

PAPER 4. Urban Forestry (DSE-2A) New **CR.3+2**

Introduction, objective and scope of urban forestry, History of Urban Forestry/Distribution and Ownership of the Urban Forest Functions and Values of the Urban Forest Urban Forest Environment Tree Hazard Assessment and Management Street, roads and parks tree inventories and Valuation The Urban Wildland Interface, Species selection for Street Tree and Park Management: Planting, Tree Maintenance, Removals Urban Forestry Ordinances, biomass estimation for carbon stock assessment and mitigation of carbon footprint calculation.

PRACTICAL

Identification of various types of forest tree species found in urban environment. Tree hazards assessment through different methods. Species selection for plantation and establishment of nursery. Biomass estimation for carbon stock in different species.

Suggested Readings:

Malcom Fisher (1999). Urban forestry: planning and management. Syrawood publication house.
V.K. Prabhakar (2000). Forestry and forest resources. Anmol Publication, New Delhi.
S S Negi (1989). Urban and recreational forestry. International book distributors, Dehradun.
S S Negi (2003). Manual of forestry. Bishen singh, Mahendra pal singh, Dehradun.

PAPER 4. LAND DEGRADATION AND RESTORATION (DSE- 2B) CR: 3+2 New

Type, factors and processes of soil/land degradation and its impact on soil productivity, including soil fauna, biodegradation and environment. Land restoration and conservation techniques- erosion

Certified 23/12/2021 S.S. Singh 23.12.2021

control reclamation of salt-affected soils; mine land reclamation, afforestation, organic products. Extent, diagnosis and mapping of land degradation by conventional and modern RS-GIS tools; monitoring land degradation by fast assessment, modern tools, land use policy, incentives and participatory approach for reversing land degradation; global issues for twenty first century.

PRACTICAL

Assessment land degraded areas, Determination of soil-moisture characteristics curve and computation of pore-size distribution. Determination of hydraulic conductivity under saturated and unsaturated conditions. Soil temperature measurements by different methods, Estimation of water balance components in bare and cropped fields.

Suggested Readings:

T.D. Biswas and G. Narayanasamy (1996). Soil Management in Relation to Land Degradation and Environment. Bull. Indian Soc. Soil Sci.17, New Delhi.
J.W. Doran and A.J. Jones (1996). Methods of Assessing Soil Quality. Soil Science Society of America, Madison.
D.J. Greenland and I. Szabolcs (1994). Soil Resilience and Sustainable Land Use. CABI.
J. Sehgal J and I.P. Abrol (1994). Soil Degradation in India - Status and Impact. Oxford & IBH.

Department : ***Department of Forestry, Wildlife & Environmental Sciences***

Programme Name : ***M. Sc. Forestry and Environmental Sciences***

Academic Year : 2022-23

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
1.	FOPBTT2	Forest Industries and Wood Technology
2.	FOPBTM1	Forest Statistics and Research Methodology
3.	FOPCLJ5	Sustainable Forest Management in Changing World
4.	FOPCTO1	Urbon Forestry
5.	FOPDPJ1	ICT Tools and Technioques Application in Forestry
6.	FOPDPJ2	Student Project and Dissertation
7.	FOPDPR1	ICT Tools and Technioques Application in Forestry
8.	FOPDPR2	Student Project and Dissertation

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2021-22

School : *Natural Resources*

Department : *Forestry, Wildlife and Environmental Sciences*

Date and Time : *October 28, 2021 – 11:30 AM*

Venue : *Smart Class Room*

The scheduled meeting of member of Board of Studies (BoS) of Department Forestry, Wildlife and Environmental Sciences, School of Studies of Natural Resources, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the M. Sc. (Forestry and Environmental Sciences) scheme and syllabi.

The following members were present in the meeting:

1. Prof. A.K. Singh (External Expert Member BoS, Dept. of Genetics and Plant Breeding, College of Agriculture, Pant Nagar)
2. Prof. S S Singh (Member BoS, Dept. Forestry, Wildlife and Environmental Sciences)
3. Dr. Dr. S.C. Tiwari (HOD, Associate Prof., Dept. Forestry, Wildlife and Environmental Sciences , Chairman, BOS)
4. Dr. K.K. Chandra (Member BoS, Associate Professor, Dept. Forestry, Wildlife and Environmental Sciences)
5. Dr. Gunjan Patil (Member, Assistant Professor, Dept. Forestry, Wildlife and Environmental Sciences)

Following points were discussed during the meeting

1. Revised CBCS ordinance of M.Sc. Forestry & Environmental Sciences.
2. CBCS/ECS scheme is implemented in any of the program of M. Sc. (Forestry and Environmental Sciences).
3. The BoS has approved the CBCS Course curriculum and ordinance of M.Sc. Forestry & Environmental Sciences with effect from academic session 2021-22.

विभागाध्यक्ष
Head
वानिकी, वन्यजीव एवं पर्यावरण विभाग
Department of Forestry, Wildlife and Environmental Science
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD

COURSE SYLLABUS
FOR

M.Sc. FORESTRY & ENVIRONMENTAL SCIENCES

Choice Based Credit System (CBCS)
(w.e.f. Academic session:2021-22)

"SCHOOL OF NATURAL RESOURCES"

DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCES
GURU GHASIDAS VISHWAVIDYALAYA
BILASPUR-495009, CHHATTISGARH
(A Central University established by the Central University Act.2009 No. 25 of 2009)

28.10.21 1 28/10/2021 28/10/2021

Course Structure

M.Sc. Forestry (2 -Year / 4- Semester) CBCS Program

Semester	Course Opted	Course Code	Name of the Course	Credit	Hour/ week	Marks
I[st] SEM	Core-01	FOPATT1	Silviculture	3	3	100
	Core-01 Practical	FOPALT1		1	3	100
	Core-02	FOPATT2	Forest Biometry, Surveying & Engineering	3	3	100
	Core-02 Practical	FOPALT2		1	3	100
	Core-03	FOPATT3	Forest Management, Remote Sensing & GIS	3	3	100
	Core-03 Practical	FOPALT3		1	3	100
	Core-04	FOPATT4	Forest Protection	3	3	100
	Core-04 Practical	FOPALT4		1	3	100
	Core-05	FOPATT5	Forest Ecology and Biodiversity Conservation	3	3	100
	Core-05Practical	FOPALT5		1	3	100
	Core -06	FOPATT6	Forest Policy, Law and Environmental Legislation	3	3	100
	Core -06 Practical	FOPALT6		1	3	100
	TOTAL			**24**	**36**	**1200**

II[nd] SEM	Core -07	FOPBTT1	Forest Tree improvement and Biotechnology	3	3	100
	Core -07 Practical	FOPBLT1		1	3	100
	Core -08	FOPBTT2	Forest Industries and Wood Technology	3	3	100
	Core -08 Practical	FOPBLT2		1	3	100
	Core -09	FOPBTT3	Wildlife Biology and Conservation	3	3	100
	Core -09 Practical	FOPBLT3		1	3	100
	Core -10	FOPBTT4	Forest Soil and Watershed Management	3	3	100

Diwali 23/10/2021 Ceely 28/10/2021 28/10/2021 28.10.2021

	Core -10 Practical	FOPBLT4		1	3	100
	Core -11	FOPBTT5	Global Environment and Climate Change	3	3	100
	Core -11 Practical	FOPBLT5		1	3	100
	RM -01	FOPBTM1	Forest Statistics and Research Methodology	3	3	100
	RM-01 Practical	FOPBLM1		1	3	100
	TOTAL			**24**	**36**	**1200**

III[rd] SEM Forest Management (FM)	**Core -01**	FOPCTJ1	Forest Resource Analysis	3	3	100
	Core-01 Practical	FOPCLJ1		1	3	100
	Core -02	FOPCTJ2	Production Management in Nursery and Plantation Forestry	3	3	100
	Core -02 Practical	FOPCLJ2		1	3	100
	Core -03	FOPCTJ3	Finance and Marketing Management of Forest Resources	3	3	100
	Core -03 Practical	FOPCLJ3		1	3	100
	Core -04	FOPCTJ4	Tree Business Management	3	3	100
	Core -04 Practical	FOPCLJ4		1	3	100
	Core -05	FOPCLJ5	Sustainable Forest Management in Changing World	3	3	100
	Core -05 Practical	FOPCLJ5		1	3	100
	OE-01	FOPCTO1	Urban Forestry	2	2	100
	Total			**22**	**32**	**1100**

IV[th] SEM Forest Management (FM)					
Dissertation/Field work/ Internship/Project/Industry Visit/ Field Visit	FOPDDJ1	Field Training (Attachment with State Forest Department for understanding of Operations and Management / Practices currently used in Forest Management.	10	30	150
	FOPDEJ1	Forest Based Industrial Training	10	30	150
	FOPDPJ1	ICT Tools and Techniques Applications in Forestry.	03	09	50
	FOPDPJ2	Student Project Dissertations.	02	06	50
	Total		**25**	**75**	**400**
GRAND TOTAL			**95**	**179**	**3900**

III[rd] SEM Forest Genetic Resources (FGR)	Core -01	FOPCTR1	Breeding Methods in Forest Trees	3	3	100
	Core -01 Practical	FOPCLR1		1	3	100
	Core-02	FOPCTR2	Forest Tree Reproductive Biology and Seed Orchards	3	3	100
	Core -02 Practical	FOPCLR2		1	3	100
	Core-03	FOPCTR3	Molecular Genetics of Forest Trees	3	3	100
	Core -03 Practical	FOPCLR3		1	3	100
	Core-04	FOPCTR4	Quantitative Genetics of Forest Trees	3	3	100
	Core -04 Practical	FOPCLR4		1	3	100
	Core -05	FOPCLR5	Forest Genetic Diversity, Conservation and Environmental Impact	3	3	100
	Core -05 Practical	FOPCLR5		1	3	100

	OE-01	FOPCTO1	Urban Forestry	2	2	100
	Total			**22**	**32**	**1100**

IVth SEM Forest Genetic Resources (FGR)					
Dissertation/Field work/Internship/ Project/Industry Visit/ Field Visit	FOPDDR1	Field Training (Attachment with State Forest Department for understanding of analysis of FGR, Forest Operations and Management of Forest Genetic Resources)	10	30	150
	FOPDER1	Forest Based Industrial Training	10	30	150
	FOPDPR1	ICT Tools and Techniques Applications in Forestry	03	09	50
	FOPDPR2	Student Projects Dissertations.	02	06	50
		Total	**25**	**75**	**400**
GRAND TOTAL			**95**	**179**	**3900**

Grand Total of Credits: 95

- The student project will be allotted in III Semester and will be evaluated at the end of IV Semester. Students will be given a topic for the project related to the curriculum by the supervisor allotted for the project.
- **Visits:** Visits to forest operation sites, forest nursery, wildlife habitats and plantation sites will be conducted as per the requirement of the curriculum.

28/10/2024 28.10.2024

New

PAPER II. FOREST INDUSTRIES AND WOOD TECHNOLOGY CR.4 (3+1)

Theory

Wood formation, kinds of wood, wood properties: physical, mechanical, acoustic and electrical properties, Wood strength, Wood moisture, Wood seasoning, defects and wood preservation. Wood machining and wood working. Concept and principle of Smart furniture, application of nano-science in wood industries. Importance of forest based industries in Indian economy, resin, tannin, gums extraction, resources of essential oil, katha and cutch, dyes and pigments.

Wood based industries: paper and pulp, match, sport goods, plywood, matchwood industries, improved wood, engineered wood, composite wood. Wood certification.

Practical

Determination of wood density, wood bulking, wood moisture, identification of wood samples, wood defects, determination of wood strength, Effectiveness of wood preservatives, Grading of wood, wood based industries, improved wood and composite wood. Extraction of essential oil, tannin, gums and natural dyes. Grading of plywood, visit of forest based industries, sawmill, timber marts.

Suggested Reading:

Chauhan Laxmi and Vijendra Rao. 2003. Wood anatomy of Legumes of India: their identification, properties and uses. Bisen Singh and Mahendra Pal Singh, Dehradun.

Eiri Board 2011. Modern Technology of wood, veneer, plywood, particle board, fiberboard, bamboo and forest products. Engineers India Research Institute, India

Mehta T. 1981. A hand book of forest utilization. Periodical expert book agency Printer and publisher, New Delhi.

Murthy T.K. 2010.Minor forest products of India. Oxford and IBH Publication, India.

Negi SS. 1997. Wood Science and Technology. International book distributor, Dehradun.

Rao KR and Juneja KBS, 1992. Field identification of 50 important timbers of India, ICFRE Publication, Dehradun, India

Sharma LC. 1977. Development of Forests and forest based industries. Bisen Singh and Mahendra Pal Singh Dehradun, India

Terry Porter 2006. Wood: Identification and use. Guilds of Master Craftsman Publication.

Tewari, D.N. 2008.Management of non-timber forest resource of India. International Book Distributor Company, Lucknow, India

Trotter H. 1992.Manual of Indian Forest Utilization. Forest Research Institute, Dehradun.

Tsoumis G. 2009. Science and Technology of Wood. Verlag Kessel

Troup RS. 2007. Manual of Indian forest utilization. Today and Tomorrow Printers and Publishers, New Delhi

28.10.2021

PAPER VI. FOREST STASTISTICS & RESEARCH METHODOLOGY **CR.4**

(3+1)

Theory

Basics of statistics: Scales of measurement, types of data: quantitative and qualitative data of forest tree species frequency arrangement, different series and its arrangement and representation methods, Central tendency: Mean, Median, Mode, Measures of Dispersion: Range, quartile deviation, Mean deviation and Standard deviation- variance, covariance, Basic concept of probability, Correlation: Concept, Karl Pearson's coefficient, Spearman rank correlation coefficient, Regression: Regression equations, linear and nonlinear regressions and regression coefficient. Tests of significance: t- test, paired t-test, Z- test and χ^2 –test

Analysis of Variance (ANOVA) - one way and two-way analysis of variance, Experiments designs: Basic concept, Principles of experimental designs, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), Split Plot and Strip Plot Designs, Comparisons of all experimental designs

Practical

Use of Excel sheet: To arrange forest based statistical data and represent in different diagram and graphical ways, Forest based measurements: arrangements and frequency distribution, Calculation

23

28.10.2024

of mean, median and mode of measured characteristics of different tree species, Finding out the relationship between the height and DBH of some forest tree species-correlations and regressions. Testing the hypothesis under t- test,z- test and χ^2-test,

ANOVA under the different types of designs: Completely Randomized Block Design, Randomized Block Design, Latin Square Design

Suggested Readings

Forestry Statistics India-1996: Indian Council of Forestry Research and Education, 1999

Mead R & Relay J. 1987. *Statistical Tools for Agro-Forestry Research - Bivariate Analysis for intercropping Experiments.* ICRAF, Nairobi.

Surendran C, Sehgal RN & Paramathma M. *Statistical Methods for Agricultural Workers.*ICAR.2003.

R. Rangaswamy: A Text Book of Agricultural Statistics, New Age International Pvt Ltd Publisher, ISBN-9788122425925, 9788122425925

Dr. S R S Chandel: A handbook of Agricultural Statistics, IMPECT PUBLISHER ISBN-9780012599754, 0012599751

PAPER V: SUSTAINABLE FOREST MANAGEMENT IN CHANGING WORLD

New

CR.4 (3+1)

Theory

Sustainable Forest Management-concept, principles, origin and challenges, sustainable forest management principles. The Montreal Process, Criteria and Indicators of Sustainable Forest Management, Bhopal India Process.

Management of Common Property Resources (CPRs) and open access resources, The role of indigenous and local communities on forest management and sustainable livelihood strategies, Sustainable Fuel wood, Sustainable NTFP management, Forests in rural development, forest societies, social and cultural factors of forest management, Forest rights of people.

Micro-level planning and participatory rural appraisal. Techniques of PRA and RRA, role of NGOs and other community based organizations in forest management. Gender dimension of forest management. Ecotourism: sustainable tourism and people's participation.

Global environmental challenges and issues, Carbon credit, CIFOR, REDD, REDD+ Payments for environmental services. National strategies and action plans for SFM, CAMPA, JFM, ASSISTED NATURAL REGENERATION, National Green Tribunal.

SFM in protected forest area, Wildlife and human conflicts, Community participation in wildlife management; International programmes for biodiversity conservation, convention on biological diversity (CBD), CITES, ITTA, IUCN, WWF, UNFCCC, Kyoto Protocol, TRIPS, (IPR) Intellectual Property Right and bio resource patenting.

Practical

Practice of Participatory Rural Appraisal technique. Preparation of micro plan for sustainable forest management. Resource survey and preparation of resource map. Exercise on designing training program for sustainable forest management. How to prepare leaflets and phamplates ?.

Suggested Readings

Anonymous. 2006.Report *of the National Forest Commission.* Govt. of India, New Delhi.

E. Claussen, V. A. Cochran, and D. P. Davis. 2001. *Climate Change: Science, Strategies, & Solutions*, University of Michigan.

Huxley P. 1999. *Tropical Agroforestry.* Blackwell Science.

Koskela J, Buck A &Teissier du Cros E. 2007.*Climate Change and Forest Genetic Diversity: Implications for Sustainable Forest Management in Europe.* Biodiversity International; Rome, Italy.

Strategies and Solutions. Pew Centre on Global Climate Change, USA.

Streck, C et al, 2006 Climate Change and Forests Emerging Policy and Market Opportunities Today & Tomorrow's Printers and Publishers New Delhi.

28.10.2021

PAPER: VI. Urban Forestry New CR.2

Theory:

Introduction, objective and scope of urban forestry, History of Urban Forestry/Distribution and Ownership of the Urban. Forest Functions and Values of the Urban Forest, Urban Forest Environment. Tree Hazard Assessment and Management of Street, roads and parks, tree inventories and Valuation. The Urban Wildland Interface, Species selection for Street Tree and Park Management: Planting, Tree Maintenance, Removals. Urban Forestry Ordinances, biomass estimation for carbon stock assessment and mitigation. Carbon footprint calculation, Report writings on different aspects of urban forestry for the improvement of communication skills.

Suggested Readings

1. Urban forestry: planning and management by Malcolm Fisher, Syrawood publication house.
2. Forestry and forest resources edited by V.K. Prabhakar, Anmol Publication, New Delhi.
3. Urban and recreational forestry by S.S. Negi, International book distributors Dehradun.
4. Manual of forestry by S.S. Negi, Bishen singh, Mahendra pal singh, Dehradun.
5. Plantation Forestry by R.K. Luna.

3. ICT TOOLS AND TECHNIQUES APPLICATION IN FORESTRY. New

Introduction to MS Office (Word, Excel, Power Point). Introduction of Statistical, GIS & plagiarisms softwares. Application of Remote sensing for forest resource measurements.

28.10.2021

Introduction to Multi-Media and its application. E-content survey consultation of scientific database concept of online learning platform (MOOCS, SWAYAM, NPTEL).

4. STUDENT REPORT DISSERTATION New

Field / laboratory based mini research work on different aspects of forestry, wildlife and environmental sciences.

28/10/2021 28.10.2021