Implementation of NEP/LOCF/CBCS / ECS

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

Academic Year : 2024-25

School : *School of Interdisciplinary Education and Research*

Department : *Rural Technology and Social Development*

Date and Time : September, 09, 2023 – *11:30 AM*

Venue : *Seminar hall*

Department of Rural Technology and Social Development
GURU GHASIDAS VISHWAVIDYALAYA
Koni- BILASPUR 495009 (Chhattisgarh)
(A Central University established under No 25 of Central Universities Act, 2009)

Minutes of the Meeting of Board of Studies held on 26-09-2023

A meeting of Board of Studies (BOS) of the Department of Rural Technology and Social Development had been held on 26-09-2023with following members to discuss, review and modify the syllabus for the degrees of B.Sc. programs in Rural Technology in compliance with NEP- 2020.

I. Prof. R. Mehta (Chairman)
II. Prof. R. S. Negi (External Expert)attended meeting online through google meet.
III. Prof. P. R. Singh (Member)
IV. Dr. Bhaskar Chaurasia(Member)
V. Dr. Alka Mishra (Member)

Agenda: To discuss, review and finalize the new syllabus of four-year program of B. Sc Rural Technology (Honors and Honors with research) to be implemented from session 2023-24.

The Chairman of BOSwelcome the BOS members and following resolutions were passed:

1. A draft of entirely new syllabus for four-year program of B. Sc. Rural Technology had been prepared with the help of all faculty members of the Department of Rural Technology in compliance with the national Education Policy- 2020 and as per guidelines of the Ordinance No 97 of the Guru Ghasidas Vishwavidyalaya. The syllabus consists of following features
   a. Syllabus for four-year UG degree program namely B.Sc. Rural Technology will be of a total of 160 credit with 40 credit every year.
   b. Degree program will have multiple entry-exit options considering UG Certificate, UG-Diploma, Degree, Honors Degree, and Honors degree with research as per GGV Ordinance No 97 in compliance with NEP-2020.
   c. In entire syllabus, there will be Major, Minor, Multidisciplinary, Ability Enhancement, Skill Enhancement, ValueAdded and Vocational/ internship Courses as per GGV Ordinance No 97 and relevant rules issued time to time.
2. A detailed scheme and syllabus for four-year UG Degree program had been finalized, which is attached with minutes of meeting of BoS.

Meeting was ended with vote of thanks by BoS Chairman.

26/9/23
Prof. R. S. Negi — Prof. P. R. Singh

20/09/2023
Dr. Bhaskar Chaurasia — Dr. Alka Mishra

26/9/23
Prof. R. Mehta (Chairman)

Signature & Seal of HoD

Scheme and Syllabus- UG

Department of Rural Technology and Social Development
Guru Ghasidas Vishwavidyalaya, Bilaspur, CG (26 September 2023)
Four Year UG Program as per NEP 2020

Semester	Courses	Paper Code	Name of the paper	Level	L/P/T	Credits	Total Credits
I	Major		Emergence of Rural Technology	2	L3+P1	4	20
	Minor		Horticulture and Landscaping	2	L3+P1	4	
	Multidisciplinary		Selection from Pool of Papers	1	L3	3	
	AEC		Language (Hindi/English)	1	L2	2	
	SEC		Dairy Management and Products	1	L2+P1	3	
	VAC		Selection from Pool of papers	1		2+2	
II	Major		Poultry Production Technology	2	L3+P1	4	20
	Minor		Microbial Technology	2	L3+P1	4	
	Multidisciplinary		Selection from Pool of papers	1		3	
	AEC		(Hindi/English)	1		2	
	SEC		Herbal Production Technology	1	L2+P1	3	
	VAC		Selection from Pool of papers	1		2+2	
	The student must complete the 4-credit vocational course/Internship during summer term to get UG certificate if he/she wish to exit the program after first 2 semester.						
III	Major		Sericulture	3	L3+P1	4	20
	Major		Rural Energy Resources	3	L3+P1	4	
	Minor		Sericulture	3	L3+P1	4	
	Multidisciplinary		Selection from Pool of papers	1		3	
	AEC		(Hindi/English)	1		2	
	SEC		Basics of Mushroom Production	1	L2+P1	3	
IV	Major		Natural Product Management	3	L3+P2	5	20
	Major		Goat and Pig Farming	3	L3+P2	5	
	Major		Apiculture and Lac culture	3	L3+P1	4	
	Minor		Apiculture and Lac culture	3	L3+P1	4	
	AEC		(Hindi/English)	1		2	

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	The student must complete the 4 credits vocational course/Internship either after first year or second year during summer term to get UG Diploma if he wishes to exit the program after 4 semesters.						
V	Major		Soil and Nutrient Management	4	L3+P2	5	21
	Major		Watershed Management	4	L3+P2	5	
	Major		Organic Farming	4	L3+P2	5	
	Minor		Organic Farming	4	L2+P2	4	
	Internship		-	-		2	
VI	Major		Land Surveying, Levelling and Drawing	4	L3+P2	5	19
	Major		Rural Social Structure and Planning	4	L3+P2	5	
	Major		Rural Health Care	4	L3+P2	5	
	Minor		Nursery Technology	4	L2+P2	4	
The students wish to exit after six semester upon securing 120 credits will be awarded UG degree in relevant subject/discipline							
After sixth semester, there will be two steams :(I) UG (Honours with research) and (II) UG (Honours). The students who will secure 75% and above may opt for UG (Honours with research).							
	(I) Course structure for UG (Honors with research)						
VII	Major		Introduction to Remote sensing and GIS	5	L3+P2	5	19
	Major		Introduction to Medicinal Plants	5	L3+P2	5	
	Major		Food Preservation Technology	5	L3+P2	5	
	Minor		Food Preservation Technology	4	L3+P1	4	
VIII	Major		Research Methodology and Ethics	5	L3+P2	5	21
	Minor		Herbal Drug Formulation Technique	5	L3+P1	4	
	Research Project/Dissertation					12	

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	(II) Course structure for UG (Honors)						
VII	Major		Introduction to Remote sensing and GIS	5	L3+P2	5	20
	Major		Introduction to Medicinal Plants	5	L3+P2	5	
	Major		Crop Production Technology	5	L3+P2	5	
	Minor		Introduction to Medicinal Plants	5	L3+P1	4	
	Seminar		-	-		1	
VIII	Major		GIS and its Applications	5	L3+P2	5	20
	Major		Introduction to Traditional Medicine Systems	5	L3+P2	5	
	Minor		Natural Product and Processing Techniques	5	L3+P1	4	
	Minor		Fundamentals of Entrepreneurship	5	L3+P1	4	
	Seminar		-	-		2	

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SYLLABUS as per NEP- 2020 B. Sc. I SEMESTER		
Course Title: EMERGENCE OF RURAL TECHNOLOGY		
Course Code: RTUATC1	Credit: 04	30+70
MAJOR/Level 2	L3+P1	Marks:100

Course outcomes

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

1. Understand basics of evolution of man and agriculture.
2. Understand indigenous technical knowledge.
3. Understand Indian society and rural technology.

Indian Agriculture: Definition, evolution of man and agriculture, beginning of agriculture in Bharat, rich agricultural heritage of Bharat, need and importance for studying agricultural heritage, globally important agricultural heritage systems.

Farmers in *Indus* period, *Vedic* period, pre- & post-independence period, rainbow revolution, plant production and protection through indigenous technical knowledge based on farm implement, pest management, soil and water conservation.

Indian society: tribal- rural- urban, nature and characteristics, demography, Settlement pattern. Causes of poverty, unemployment, livelihood sources, migration.

Rural Technology: Definition, Innovation in rural areas, entrepreneurship and skill development.

Suggested Readings:

Handbook of agriculture, ICAR
Farmers' handbook on basic agriculture

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	3	-	-	3	1
CO2	3	3	1	-	2	3	3	-	-	3	1
CO3	3	3	1	-	2	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

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Course Title: LAB- EMERGENCE OF RURAL TECHNOLOGY		
Course Code: RTUALC1	Credit: 01	Marks:30+70

1. Exposure visits to Agricultural / Horticultural / Poultry Farm/ Dairy Farm
2. Preparation of different models based on theory course.
3. To study about success story, innovations of the farmers.

SYLLABUS as per NEP- 2020 B. Sc. I SEMESTER		
Course Title: HORTICULTURE AND LANDSCAPING		
Course Code: RTUATG1	Credit: 04	30+70
MINOR /Level 2	L3+P1	Marks:100

Course outcomes

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

1. Understand the knowledge about horticulture practices and its importance.
2. Learn detail information of orchard establishment and management will able to disseminate this knowledge to the farmers.
3. Adopt horticulture as entrepreneurship.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	3	-	-	3	1
CO2	3	3	1	-	2	3	3	-	-	3	1
CO3	3	3	1	-	2	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Horticulture: Concept, scope, definition, economic importance and classification of horticultural crops, fruit and vegetable zones of India, exports and imports opportunities, Government schemes / programs related to horticulture and landscaping.

Establishment of orchard: site selection, principles, planning and layout of orchard, tools and implements. Management of orchard-planting systems, training and pruning, nutrient, water, weeds, and pests management in orchard trees. Cultivation practices of major fruit crops-Citrus fruits, papaya, banana, ber, guava and mango.

Fundamental of Floriculture, Scope and importance of floriculture in India, Importance and production technology of cut flowers and loose flowers. Production techniques of ornamental plants like rose, marigold, chrysanthemum, gladiolus, jasmine, dahlia, tuberose and gerbera.

Landscaping: Principles and components, landscape designs, Styles of garden: formal, informal and free style gardens; types of landscape: Urban landscaping, bio-aesthetic planning, eco- tourism, theme parks, indoor gardening.

Plant components for landscaping: Lawns-Establishment and maintenance, Plants- herbs, annuals, hedges, climbers and creepers, cacti and succulents, flower borders and beds, ground covers, carpet beds, bamboo groves.

Course Title: LAB- HORTICULTURE AND LANDSCAPING		
Course Code: RTUALG1	**Credit:01**	**Marks:30+70**

1. Identification of garden equipment required for gardening and landscaping.
2. Preparation and maintenance of garden
3. Propagation and maintenance of annuals and perennials.
4. Training and Pruning of plants
5. Cutting, budding and grafting practices.
6. Identification of common garden weeds.
7. Making of Bonsai, Terrarium culture.

Suggested Readings:
Commercial Floriculture – V.H. Ries and A. Lasrice
Floriculture and Land Scaping – Desh Raj
Cultivation of Minor Fruit – B. C. Das and S. N. Das
Plant Propagation and Nursery Husbandary – J. S. Yadav
Fruit Production- K. N. Dubey
Modern Oleri and Floriculture – G. S. Sainey

SYLLABUS as per NEP- 2020 B. Sc. I SEMESTER Course Title: DAIRY MANAGEMENT AND PRODUCTS		
Course Code: RTUATL1	**Credit: 03**	**30+70**
SEC/ Level 1	L2+P1	**Marks:100**

Course outcomes
On completion of this course, the students will be able to:

1. Identify different breeds of cows and buffaloes and their feeding management
2. Understand housing and health management of cows and buffaloes.
3. Understand general caring practices needed for cows and buffaloes.
4. Prepare various dairy products and enhance their skill for establishment of Dairy.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	3	-	-	3	1
CO2	3	3	1	-	3	3	3	-	-	3	1
CO3	3	3	1	-	3	3	3	-	-	3	1
CO4	3	3	1	-	3	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Introduction of important breeds of cows and buffaloes, Government schemes / programs related to Dairy Industry.

Dairy farm management: Location of different farm buildings, Design and structure of sheds/shelters materials used for shed/shelters, essential appliances and hygiene, types of barns, housing systems. Care of dry and milch cows and maintenance of different dairy cattle registers.

Fodder: Classification, hey preparation, types, qualities, principles and calculation of ration. Animal Breeding Methods: Mating seasons, inbreeding and out breeding, their advantages and disadvantages, Artificial Insemination- its methods, importance, limitations.

Animal Diseases: Foot and mouth disease, Anthrax, Black Quarter, Rinderpest, Mastitis and Haemorrhagic septicemia –their diagnosis, treatment, precautions, vaccination schedule.

Dairy Products: Processing of milk, pasteurization of milk, method of preparation of butter, cheese, khoa, paneer, yoghurt, cream, and shrikhand.

Suggested Readings:
Amlendu Chakerbarti Handbook of Animal Husbandary"
Jagdish Prasad: Poultry Production and Management"
R.A. Singh: Poultry production"
Jagdish Prasad: Principle and practice of Dairy Farm Management"
B. Panda & B.R. Reddy: Feeding of poultry
Eiri Board of Consultant & Engineers: Hand Book of Dairy Farming
D. Ramaswamy: Dairy Technology Hand Book
P.N. Bhatt and B.U. Khan: Goat Production

Course Title: LAB-DAIRY MANAGEMENT AND PRODUCTS		
Course Code: RTUALL1	**Credit:01**	**Marks: 30+70**

Course outcomes
On completion of this course, the students will be able to:

1. Gain in-depth knowledge of dairy production and processing techniques.
2. Gain proficiency in quality control and food safety practices specific to the dairy industry.
3. Gain ability to operate and maintain dairy machinery and equipment.
4. Understand of the economic and environmental aspects of the dairy sector.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	3	-	-	3	1
CO2	3	3	1	-	3	3	3	-	-	3	1
CO3	3	3	1	-	3	3	3	-	-	3	1
CO4	3	3	1	-	3	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Visit to cow, buffalo, and goat farms and report preparation.
2. Study of system of housing for cattle and goats.
3. Visit to dairy plant and report submission.
4. Calculation of ration for cow, buffalo, and goat.
5. Preparation of various dairy products paneer, shrikhand, khoa etc.
6. Various adulterations and their tests in milk.

SYLLABUS as per NEP-2020 B.Sc. II SEMESTER Course Title: POULTRY PRODUCTION TECHNOLOGY		
Course Code: RTUBTC1	**Credit: 04**	**30+70**
MAJOR/ Level 2	**L3+P1**	**Marks:100**

Course outcomes
On completion of this course, the students will be able to:

1. Study the Poultry production techniques and their management.
2. Identify the different types of Layer chickens and their management.
3. Establish entrepreneurship in this field.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Breeds and Nutrition: Identification and characteristics of important Indian and Exotic poultry breeds. Poultry nutrition- nutrients and their function, energy sources, vegetable and animal protein sources.

Poultry farm Management: Farm system, provisions for good housing, commercial chick, grower, broiler and layer management.

Breeding and products technology: Principles of breeding, breeding system, development of layer and broiler varieties. Assessment of egg quality, nutritive value of eggs, grading of eggs, processing and preservation of poultry products, egg and meat products.

Poultry health management: Symptoms, treatment/control and vaccination strategies of- Viral disease (New castle disease, fowl pox, avian influenza, polyneuritis), Bacterial disease (Pullorum, fowl typhoid, fowl cholera, chronic respiratory disease), Parasitic disease (Coccidiosis) and Fungal disease (Mycotic pneumonia).

Other poultry species and marketing strategies: elementary knowledge of other poultry species- duck, quail, turkey, emu, geese and pigeon. Egg and meat marketing, distribution channel, exports.

Course Title: LAB- POULTRY PRODUCTION TECHNOLOGY		
Course Code: RTUBLC1	**Credit:01**	**Marks: 30 + 70**

Course outcomes
On completion of this course, the students will be able to:

1. Know the requirements of the main commercial poultry systems and deliver routine husbandry procedures and poultry production performance.
2. Learn about the poultry farming, site selection, and accommodation arrangements, handling of birds, feed and water.
3. Gain skill to maintain the health of birds from diseases, symptoms, culling, vaccination etc.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Identification and morphological study of poultry breeds.
2. Assessment of quality of egg.
3. Study of housing system for poultry.
4. Study of feed and feeding equipments.
5. Study of various types of poultry diseases and treatment.
6. Visit to poultry farms and report preparation.

Suggested Readings:
Amlendu Chakerbarti: Handbook of Animal Husbandary"
Jagdish Prasad: Poultry Production and Management"
R.A. Singh: Poultry production

SYLLABUS as per NEP- 2020 B.Sc. II SEMESTER Course Title: MICROBIAL TECHNOLOGY		
Course Code: RTUBTG1	**Credit: 04**	**30+70**
MINOR/ Level 2	**L3+P1**	**Marks:100**

Course outcomes
On completion of this course, the students would be able to

1. Learn historical background of microbiology.
2. Understand about the microorganism and their usefulness and also their harmful effects.
3. Learn economically important microorganisms and their functioning.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	3	-	-	3	1
CO2	3	3	1	-	2	3	3	-	-	3	1
CO3	3	3	1	-	2	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

History of microbiology, Scope of microbiology, Viruses- general characters, Bacteria- general characters, Staining – types of staining, Gram staining technique, Economic importance of bacteria.

Mycoplasma- general characters. Actinomycetes – General characters, Cyanobacteria- general characters, Structure of heterocyst.

Introduction to fermentation technology- Definition of fermentation, fermenter configuration, general aspects of production of Streptomycin, Amylase, Citric acid, Ethyl alcohol and vitamin B 12 by microbial fermentation.

Yeast and its uses, Uses of yeast and Yeast products, Microbiology of milk, production of yoghurt, butter milk, cheese, spoilage of food and techniques of food preservation.

Organic matter decomposition: composition of litter, microorganisms associated with organic matter decomposition, Organic compost, Factors affecting the composting-microorganisms.

Suggested Readings:

1. A text book of microbiology- R.C. Dubey and D.K. Maheshwari
2. Industrial Microbiology- A.H. Patel
3. Microbiology Fundamentals and Application- S.S. Purohit
4. General Microbiology- Powar and Daghinawala
5. Microbiology A System Approach- M.K. Cowan
6. Microbiology- L.M. Prescott

Course Title: LAB- MICROBIAL TECHNOLOGY		
Course Code: RTUBLG1	Credit:01	Marks:30+70

Course outcomes

On completion of this course, the students would be able to:

1. Know about the types of microorganisms in and around humans and metabolism and mechanism of microbial life.
2. Learn the important and diversified groups of micro-organisms in nature and their classification, and interactions within the microbial communities and between microorganism and plants and animals.
3. Knowledge about use of microbiological equipment and observations.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	3	-	-	3	1
CO2	3	3	1	-	2	3	3	-	-	3	1
CO3	3	3	1	-	2	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Laboratory course-

1. Study of basic instruments used in microbial techniques- Laminar air flow, oven, Incubator, Autoclave.
2. Gram staining technique for the identification of Gram +ve and Gram –ve bacteria.
3. Identification of Nostoc, Anabaena, Rhizopus, Yeast
4. Detection of adulteration in food items.
5. Study of various food preservative methods.

SYLLABUS as per NEP- 2020 B.Sc. II SEMESTER Course Title: HERBAL PRODUCTION TECHNOLOGY		
Course Code: RTUBTL1	Credit: 03	30+70
SEC/ LEVEL-2	L2+P1	Marks:100

Course outcomes

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

1. Aware with the vast medicinal flora and their scientific role.
2. Gain technical confidence and skills to develop entrepreneurship.
3. Understand herbal production techniques of various herbal products.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Ayurvedic dosage form – Classification, Extraction- Kwatha, Pachana, Avaleha, Bhawwan, Putapka, Fermentation- Asava & Arista, Arka, Guggulu, Ghrita, Churna, Lepa, Vati and Gutikabhasma, Lauha.

Appartus-Dolyantram, Svedaniyantram, Dhupayantram, Patanayantram, Adhaspatanyantram, Tirgakapatanyantram, Vidhyadharyantum, Putas, Mahaputa, Musha, Hamspakayantram.

Utilisation and development of drugs from plants- Analgesic drugs, anti- inflammatory drugs, hypotensive drugs, antimalerial drugs, anti-cancer drugs, cardiovascular drugs, bronchodilatory drugs.

Herbal Preparations- Triphala churna, sitopaladi churna, Preparation of Avleha-Chyawanprash, Preparation of Asawas- Drakshasava, Preparation of Tooth powder, Preparation of beauty products.

Course Title: LAB- HERBAL PRODUCTION TECHNOLOGY		
Course Code: RTUBLL1	Credit:01	Marks: 30 + 70

Course outcomes

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

1. Gain knowledge about the selection and processing of herbal drugs as raw materials for herbal drug preparation.
2. Learn about principles of traditional medicinal systems with method of preparation and standardization of crude and ayurvedic formulation.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5

Department of Rural Technology & Social Development
Guru Ghasidas Vishwavidyalaya, Koni-Bilaspur (CG)
Semester-wise syllabus for 4 Years UG Program, Session 2023-2024 onwards under NEP-2020

B. Sc. (Rural Technology)

SYLLABUS as per NEP- 2020 B.Sc. III SEMESTER		
Course Title: SERICULTURE		
Course Code: RTUCTC1	Credit: 04	30+70
MAJOR/ LEVEL 3	L2+P2	Marks:100

Course outcomes

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

1. Learn the scientific method of rearing, cultivation of silkworm and management of host plants.
2. Identify the various seed cocoon, commercial cocoon, silk fibre and get knowledge of diseases and pests management of host plant.
3. Obtain job opportunities in the public, private and government sectors.
4. Gain technical confidence and skills for establishment of orchards.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	3	-	-	3	1
CO2	3	3	1	-	3	3	3	-	-	3	1
CO3	3	3	1	-	3	3	3	-	-	3	1
CO4	3	3	1	-	3	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Introduction to Sericulture: Definition, history and importance of sericulture, sericulture industry in India, prospects and problems, Study of mulberry and non-mullberry silk worms- Tasar, Eri and Muga including classification, geographical distribution, hosts plants and silk characteristics produced.

Biology of silk moth: Anatomy of and behavior silk worm- Digestive system including mouth parts, Reproductive system, life cycle including moulting and metamorphosis, silk glands, spinning of silk threads, diseases and pests of mulberry silk worm.

Host plant cultivation: Types of host plants for sericulture, effects of agro–climatic conditions on the growth of host plants with special reference to mulberry, mulberry cultivation and its management, diseases, pests and predators of mulberry plant.

Rearing techniques: Ideal rearing house and its types, advantages and disadvantages, various rearing appliances, Young age (chawki rearing) and late age rearing, mountages and mounting, harvesting of cocoons.

Reeling: Grading of reeling cocoons, stifling of cocoons, reeling machines: charkha, cottage basin, processing of raw silk.

Course Title: LAB- SERICULTURE		
Course Code: RTUCLC1	Credit:01	Marks:30+70

Course outcomes

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

1. Student will gain the skill with hands on training on mulberry cultivation and carry forward to field.

2. Understand the procedure of silkworm egg production and support grainage activity.
3. Acquire knowledge and develop skill in silkworm rearing and support silkworm farming.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	3	-	-	3	1
CO2	3	3	1	-	3	3	3	-	-	3	1
CO3	3	3	1	-	3	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Study of host plants of silk worms.
2. Plantation techniques (pit and row) of host plants.
3. Study of propagation techniques of host plants.
4. Study of morphological characters of silk worm.
5. Identification of pests and predators of silk worm.
6. Dissection of alimentary canal and silk gland and study of their various parts.
7. Visit to nearest silk worm rearing centers.
8. Visit to rearing centers to observe the silk worm diseases and collection of diseased worms.

Suggested Readings:

Sericulture introduction – Ganga, G.
Seri Manual – FAO Manual
Appropriate Sericulture – Jolly, M.S.
Sericulture in India- Vol. I to IV, H.O. Agrawal and M.K. Seth.
An introduction to Sericulture –G.J. Sulochana
Principle of temperate Sericulture – Dr. A.S. Kamal, Kamayani Publisher
Silk reeling and testing manual- Youngwoolee (Daya Pub. House).

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SYLLABUS as per NEP 2020 B.Sc. III SEMESTER		
Course Title: RURAL ENERGY RESOURCES		
Course Code: RTUCTC2	Credit: 04	30+70
MAJOR/ LEVEL 3	L3+P1	Marks:100

Course outcomes

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

1. Understand various energy resources prevalent in India.
2. Aware about energy consumption in rural India.
3. Understand energy conservation and utilization techniques.
4. Aware about limited energy resources and their alternatives.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	-	3	-	3	2
CO2	3	3	1	-	3	3	-	3	-	3	2
CO3	3	3	1	-	3	3	-	3	-	3	2
CO4	3	3	1	-	3	3	-	3	-	3	2

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Introduction, Sources of energy, classification of energy, Energy demand in rural and urban sector, future energy challenges, Need for rural energy development.

Bio-gas technology, anaerobic fermentation process, hydrolysis, acidification and methanol-genesis, factors affecting gas yield, retention time, composition and characteristics of bio-gas, bio-gas uses, bio-gas model.

Solar Energy- Solar radiation, solar water heating, solar drying, solar greenhouse, solar energy use in rural areas. Solar cell, PV Cells, Type of PV system, Efficiency of solar cells, application of solar photovoltaic.

Bio-fuel properties, characteristics, petro crops, biodiesel, economic feasibility of biodiesel.

Problems in rural energy sector, farm forestry, harvest flexibility, species, calorific value, energy plantations.

Course Title: LAB- RURAL ENERGY RESOURCES		
Course Code: RTUCLC2	Credit:01	Marks:100

Course outcomes

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

1. Understand the need of energy conversion and the various methods of energy storage.
2. Learn about the field applications of solar energy.
3. Gain skill on bio gas generation and its impact on environment.
4. Understand the direct energy conversion systems and their applications.

Course Outcomes and their mapping with Program Outcomes:

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COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	-	3	-	3	2
CO2	3	3	1	-	3	3	-	3	-	3	2
CO3	3	3	1	-	3	3	-	3	-	3	2
CO4	3	3	1	-	3	3	-	3	-	3	2

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. To study about petro-crops.
2. To study about biogas plant.
3. To study the biomass.
4. Identification of different types of coal.
5. To study about energy plantation.
6. Visit to various power plant.
7. Submission of Visit reports.

Suggested Readings:
Non conventional energy – G.D. Rai
Energy security – D. Bhaskaran Rao

SYLLABUS as per NEP- 2020		
B.Sc. III SEMESTER		
Course Title: SERICULTURE		
Course Code: RTUCTG1	Credit: 04	30+70
MINOR/ LEVEL 3	L3+P1	Marks:100

Course outcomes
On completion of this course, the students will be able to:

1. Learn the scientific method of rearing, cultivation of silkworm and management of host plants.
2. Identify the various seed cocoon, commercial cocoon, silk fibre and get knowledge of diseases and pests management of host plant.
3. Obtain job opportunities in the public, private and government sectors.
4. Gain technical confidence and skills for establishment of orchards.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	3	-	-	3	1
CO2	3	3	1	-	3	3	3	-	-	3	1
CO3	3	3	1	-	3	3	3	-	-	3	1
CO4	3	3	1	-	3	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Introduction to Sericulture: Definition, history and importance of sericulture, sericulture industry in India, prospects and problems, Study of mulberry and non-mullberry silk worms- Tasar, Eri and Muga including classification, geographical distribution, hosts plants and silk characteristics produced.

Biology of silk moth: Anatomy of and behavior silk worm- Digestive system including mouth parts, Reproductive system, life cycle including moulting and metamorphosis, silk glands, spinning of silk threads, diseases and pests of mulberry silk worm.

Host plant cultivation: Types of host plants for sericulture, effects of agro–climatic conditions on the growth of host plants with special reference to mulberry, mulberry cultivation and its management, diseases, pests and predators of mulberry plant.

Rearing techniques: Ideal rearing house and its types, advantages and disadvantages, various rearing appliances, Young age (chawki rearing) and late age rearing, mountages and mounting, harvesting of cocoons.

Reeling: Grading of reeling cocoons, stifling of cocoons, reeling machines: charkha, cottage basin, processing of raw silk.

Course Title: LAB- SERICULTURE		
Course Code: RTUCLG1	Credit:01	Marks:100

Course outcomes

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

1. Student will gain the skill with hands on training on mulberry cultivation and carry forward to field.
2. Understand the procedure of silkworm egg production and support grainage activity.
3. Acquire knowledge and develop skill in silkworm rearing and support silkworm farming.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	3	3	3	-	-	3	1
CO2	3	3	1	-	3	3	3	-	-	3	1
CO3	3	3	1	-	3	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Study of host plants of silk worms.
2. Plantation techniques (pit and row) of host plants.
3. Study of propagation techniques of host plants.
4. Study of morphological characters of silk worm.
5. Identification of pests and predators of silk worm.
6. Dissection of alimentary canal and silk gland and study of their various parts.
7. Visit to nearest silk worm rearing centers.
8. Visit to rearing centers to observe the silk worm diseases and collection of diseased worms.

Suggested Readings:

Sericulture introduction – Ganga, G.
Seri Manual – FAO Manual
Appropriate Sericulture – Jolly, M.S.
Sericulture in India- Vol. I to IV, H.O. Agrawal and M.K. Seth.
An introduction to Sericulture –G.J. Sulochana
Principle of temperate Sericulture – Dr. A.S. Kamal, Kamayani Publisher
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Course Title: LAB-BASICS OF MUSHROOM PRODUCTION		
Course Code: RTUCLL1	Credit:01	Marks:30+70

Course outcomes

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

1. To identify edible types of mushroom.
2. Gain the knowledge of cultivation of different types of edible mushrooms and spawn production
3. To manage the diseases and pests of mushrooms and to evolve themselves towards self-employment and income generation.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	3	-	-	3	1
CO2	3	3	1	-	2	3	3	-	-	3	1
CO3	3	3	1	-	2	3	3	-	-	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Identification of different mushroom species.
2. Equipment's used in mushroom production.
3. Culture preparation and Spawn preparation.
4. Different types of mushroom production.
5. Different types of Mushroom bed preparation.
6. Mushroom hut management.
7. Study of different types of pests and diseases of mushroom.

Suggested Readings:

The Mushroom Identifier- David Pegler & B. Sproner.
Mushroom Cultivation- B. Tripathi & H.P. Shukla
Mushroom Growing- S.C. Day

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SYLLABUS as per NEP 2020 B.Sc. IV SEMESTER		
Course Title: NATURAL PRODUCT MANAGEMENT		
Course Code: RTUDTC1	Credit: 05	30+70
MAJOR/ LEVEL-3	L3+P2	Marks:100

Course outcome:

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

1. Understand non timber forest products and their importance.
2. Develop understanding of grasses of economic importance.
3. Identify the common natural products of plant origin and its production and processing.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Definition, contribution of natural products for National Economy, important non timber products of forest area, and their role in rural economy and livelihood.

Classification and use of grasses, bamboos and canes. Economic importance of grasses, bamboos and canes. Essential oils. Importance of oils and waxes in rural economy.

Tannes and it uses – Wood tannes, bark tannes, fruit tannes and leaf tannes, Dyes- wood, bark, flower and fruit dyes, root dyes leaf dyes, animal dyes, uses of tannins and dyes in Rural industries,

Gums and Resins- true gumes, hard resins, oleo resins, utilizations of gums and resins, gum and resin tapping. Manufacturing of turpentine, katha, cutch and charcoal.

Management of Natural Products- collection, storage, utilization pattern of non timber products and their marketing.

Course Title: LAB-NATURAL PRODUCT MANAGEMENT		
Course Code: RTUDLC1	Credit:01	Marks: 30 + 70

Course outcomes

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

1. Gain a broad knowledge of the major classes of natural products and be able to describe several detailed examples for each.
2. Understand the need, when developing product concepts, to consider issues around indigenous knowledge, traditional use, cultural perspectives and ownership of native flora and fauna.
3. Gain fundamental practical laboratory skills in the extraction, purification and analysis of natural products.

Course Outcomes and their mapping with Program Outcomes:

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COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Study of local Non timber forest products (NTFPs).
2. Preparation of dyes.
3. To study the source of Tannes, gum and resins.

Suggested Readings
Non – Timber Forest Product – S. Negi.
Forest Non – Wood Resources – A.P. Dewadi.
Indian Forest Utilization Vol.- II, FRI Edition

SYLLABUS as per NEP- 2020 B.Sc. IV SEMESTER		
Course Title: GOAT AND PIG PRODUCTION TECHNIQUES		
Course Code: RTUDTC2	Credit: 05	30+70
MAJOR/ LEVEL-3	L3+P2	Marks:100

Course outcome:
On completion of this course, the students will be able to:

1. Identify different breeds of goats and pigs and understanding of their feeding management.
2. Understand housing and health management of goats and pigs.
3. Understand general caring practices needed for goats and pigs.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Breeds, Breeding and Feeding of goats: Characteristics of important Indian breeds of goat of different regions. Modern techniques in reproduction. Feed, forage, nutrition and rationing.

Housing and health management in goats: Sheds/shelters and their orientation, ventilation, height and roofing material, floor type and space, shelter surroundings, essential appliances and hygiene. Health management in goats.

General caring practices of goat: determination of age, identification, disbudding and dehorning, castration, exercise, hoof trimming, care of bucks, mating seasons, care of kids, does, Techniques of milking and its collection.

Breeds, Breeding and Feeding of pigs: Characteristics of important breeds of pigs. Breeding systems, feeding and rationing.

Housing and health management in pigs: Housing strategies for different members in pig, wallows, essential appliances and hygiene. Marketing and transport of pigs.

Pig disease (tuberculosis, mycoplasma pneumonia, Colibacelliosis, Brucellosis, Swine fever, foot and mouth disease, swine pox, ascariasis).

Course Title: LAB- GOAT AND PIG PRODUCTION TECHNIQUES		
Course Code: RTUDLC2	Credit:01	Marks:30+70

Course outcomes

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

1. Understand the importance of record keeping, principles of housing and feeding, breeding management to improve the reproductive efficiency and detailed account on care and management of different classes of goat and pig.
2. Gain knowledge on various aspects of health care of pig and goat.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Identification of important breeds of goats and pigs.
2. Visit to goat /pig farms and report preparation.
3. Study of housing system for goats and pigs.
4. Calculation of ration for goat and pig.
5. Pathological conditions of diseases

Suggested Readings:

Amlendu Chakerbarti Handbook of Animal Husbandary"
Jagdish Prasad:. Principle and practice of Dairy Farm Management"
Eiri Board of Consultant & Engineers: Hand Book of Dairy Farming
P.N. Bhatt, N.H. Mohan and Such Deo: Pig Production
P.N. Bhatt and B.U. Khan: Goat Production

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SYLLABUS as per NEP- 2020 B.Sc. IV SEMESTER		
Course Title: ALPICULTURE AND LAC CULTURE		
Course Code: RTUDTC3	Credit: 4	30+70
MAJOR/ LEVEL-3	L3+P1	Marks:100

On completion of this course, the students will be able to:
1. Understand the basics of apiculture and lac culture.
2. Identify various species of Honey Bee
3. Understand the life cycle of lac insect and its various host

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Biology of honey bees: Classification and geographical distribution of bee and their races, morphology of honey bee, bee casts, internal anatomy of honey bee, life cycle of honey bee, royal jelly, bee bread and wax, swarming, absconding and supercedure, social organization in honey bee, morphology of bee-hive, bee communication, diseases and pests of honey bee.

Introduction to Apiculture: Definition and scope of apiculture, artificial bee keeping (Apiary), collection techniques of honey from natural sites, physical and chemical properties of honey, Utilization of honey and wax in different commercial products.

Biology of lac insect: Classification and morphology of lac insect, life cycle of lac insect, lac glands and their distribution, history of lac culture in India, states cover under lac production.

Introduction to lac culture: Important host plant species for lac cultivation, Lac cultivation technology, processing technique of raw lac, production of shellac and white lac, study of different types of lac, commercial and domestic use of lac, enemies of lac culture and control measures.

Course Title: LAB- APICULTURE AND LAC CULTURE		
Course Code: RTUDLC3	Credit:01	Marks:30+70

Course outcomes

On completion of this course, the students will be able to:
1. Understand the methods and practices of apiculture and lac culture.
2. Identify various species of Honey Bee and lac insects and their host plants.
3. Practical aspects of various products of apiculture and lac production.

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Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Visit to nearby apiary and lac production unit and report preparation.
2. Identification of species of honey bees and methods of apiculture in farm.
3. Uses of various products of honey bees in daily life.
4. Identification of different host plants for lac cultivation.
5. Identification of different types of lac.
6. Practical uses of lac in making different products.
7. Study of equipment used in apiary and lac production.

Reference Books:

Chapman: The Insects: structure and function 94th ed, 1998, ELBS)
Imms: A general text book of entomology, 2 vol. (1997, Asia publishing house)
Mcgavin: Essential Entomology 92001, Oxford Univ Press)
Srivastava: A textbook of applied entomology, vol.I & vol II (1993, Kalyani publishers)
The Insect. Ramesh Arora and G. S. Dariwal
The World of Honey Bee. A.S. Atwal
Bee Keeping for pleasure and profit. Moh. Naim.
Honeybee Disease and Management. D.P. Abrol.
Perspective In Indian Apiculture. R.C. Mishra
Atlas of Indian Lac, Ajit Prasad Jain.
Lac cultivation in India. M. G.Kamath
A handbook of shellac Analysis. G.N. Bhattacharya and P.K. Bose.

SYLLABUS as per NEP- 2020 B.Sc. IV SEMESTER		
Course Title: ALPICULTURE AND LAC CULTURE		
Course Code: RTUDTG1	Credit: 4	30+70
MINOR/ LEVEL-3	L3+P1	Marks:100

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

4. Understand the basics of apiculture and lac culture.
5. Identify various species of Honey Bee
6. Understand the life cycle of lac insect and its various host

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

Biology of honey bees: Classification and geographical distribution of bee and their races, morphology of honey bee, bee casts, internal anatomy of honey bee, life cycle of honey bee, royal jelly, bee bread and wax, swarming, absconding and supercedure, social organization in honey bee, morphology of bee-hive, bee communication, diseases and pests of honey bee.

Introduction to Apiculture: Definition and scope of apiculture, artificial bee keeping (Apiary), collection techniques of honey from natural sites, physical and chemical properties of honey, Utilization of honey and wax in different commercial products.

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Introduction to lac culture: Important host plant species for lac cultivation, Lac cultivation technology, processing technique of raw lac, production of shellac and white lac, study of different types of lac, commercial and domestic use of lac, enemies of lac culture and control measures.

Course Title: LAB- APICULTURE AND LAC CULTURE		
Course Code: RTUDLG1	Credit:01	Marks:30+70

Course outcomes

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

4. Understand the methods and practices of apiculture and lac culture.
5. Identify various species of Honey Bee and lac insects and their host plants.
6. Practical aspects of various products of apiculture and lac production.

Course Outcomes and their mapping with Program Outcomes:

COs	POs						PSOs				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	-	2	3	-	3	3	3	1
CO2	3	3	1	-	2	3	-	3	3	3	1
CO3	3	3	1	-	2	3	-	3	3	3	1

Weightage: 1-Slightly; 2-Moderately; 3-Strongly

1. Visit to nearby apiary and lac production unit and report preparation.
2. Identification of species of honey bees and methods of apiculture in farm.
3. Uses of various products of honey bees in daily life.
4. Identification of different host plants for lac cultivation.
5. Identification of different types of lac.
6. Practical uses of lac in making different products.
7. Study of equipment used in apiary and lac production.

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Srivastava: A textbook of applied entomology, vol.I & vol II (1993, Kalyani publishers)
The Insect. Ramesh Arora and G. S. Dariwal
The World of Honey Bee. A.S.Atwal
Bee Keeping for pleasure and profit. Moh. Naim.
Honeybee Disease and Management. D.P.Abrol.
Perspective In Indian Apiculture. R.C.Mishra
Atlas of Indian Lac, Ajit Prasad Jain.
Lac cultivation in India. M.G.Kamath
A handbook of shellac Analysis. G.N.Bhattacharya and P.K.Bose.