Syllabus

B. Sc. (Rural Technology)

2023-2024 onwards

Under NEP-2020

DEPARTMENT OF RURAL TECHNOLOGY AND SOCIAL DEVELOPMENT

GURU GHASIDAS VISHWAVIDYALAYA

(A Central University)

Koni- Bilaspur 495009 Chhattisgarh

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 N

B. Sc. (Rural Technology)

Semester	Courses	Paper Code	Name of the paper	Level	L+P+T	Credits
I	Major	RTUATC1	Emergence of Rural Technology	2	3+0+0	3
		RTUALC1	Lab-Emergence of Rural Technology		0+0+1	1
	Minor	RTUATG1	Horticulture and Landscaping	2	3+0+0	3
		RTUALG1	Lab-Horticulture and Landscaping		0+0+1	1
	Multi-disciplinary		To be selection from Pool of Courses	1	3+0+0	3
	AEC		Language (Hindi/English)	1	2+0+0	2
	SEC		To be selection from Pool of Courses	1	2+0+0	2
			To be selection from Pool of Courses		0+0+1	1
	VAC1		Environment Education	1	2+0+0	2
	VAC2		To be selection from Pool of Courses	1	2+0+0	2
II	Major	RTUBTC1	Poultry Production Technology	2	3+0+0	3
		RTUBLC1	Lab- Poultry Production Technology		0+0+1	1
	Minor	RTUBTG1	Microbial Technology	2	3+0+0	3
		RTUBLG1	Lab- Microbial Technology		0+0+1	1
	Multidisciplinary		To be selection from Pool of Courses	1	3+0+0	3
			To be selection from Pool of Courses			
	AEC		(Hindi/English)	1	2+0+0	2
	SEC		To be selection from Pool of Courses	1	2+0+0	2
			To be selection from Pool of Courses		0+0+1	1
	VAC 1		Environment Education	1	2+0+0	2
	VAC 2		To be selection from Pool of Courses	1	2+0+0	2

The student must complete the 4-credit vocational course/Internship during summer term to get UG ce
program after first 2 semester.

III	Major	RTUCTC1	Sericulture	3	3+0+0	3	20	30	70	100
		RTUCLC1	Lab- Sericulture		0+0+1	1		30	70	100
	Major	RTUCTC2	Rural Energy Resources	3	3+0+0	3		30	70	100
		RTUCLC2	Lab- Rural Energy Resources		0+0+1	1		30	70	100
	Minor	RTUCTG1	Sericulture	3	3+0+0	3		30	70	100
		RTUCLG1	Lab- Sericulture		0+0+1	1		30	70	100
	Multi-disciplinary Course		To be selection from Pool of Courses	1	3+0+0	3		30	70	100
			To be selection from Pool of Courses					30	70	100
	AEC		(Hindi/English)	1	2+0+0	2		30	70	100
	SEC		To be selection from Pool of Courses	1	2+0+0	2		30	70	100
			To be selection from Pool of Courses		0+0+1	1		30	70	100
							Total	**330**	**770**	**1100**
IV	Major	RTUDTC1	Natural Product Management	3	3+0+0	3	20	30	70	100
		RTUDLC1	Lab- Natural Product Management		0+0+2	2		30	70	100
	Major	RTUDTC2	Goat and Pig Production Techniques	3	3+0+0	3		30	70	100
		RTUDLC2	Lab- Goat and Pig Production Techniques		0+0+2	2		30	70	100
	Major	RTUDTC3	Apiculture and Lac culture	3	3+0+0	3		30	70	100
		RTUDLC3	Lab- Apiculture and Lac culture		0+0+1	1		30	70	100
	Minor	RTUDTG1	Apiculture and Lac culture	3	3+0+0	3		30	70	100
		RTUDLG1	Lab- Apiculture and Lac culture		0+0+1	1		30	70	100
	AEC		(Hindi/English)	1	2+0+0	2		30	70	100
							Total	**270**	**630**	**900**
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	RTUETC1	Soil and Nutrient Management	4	3+0+0	3	21	30	70	100
		RTUELC1	Lab- Soil and Nutrient Management		0+0+2	2		30	70	100
	Major	RTUETC2	Watershed Management	4	3+0+0	3		30	70	100
		RTUELC2	Lab- Watershed Management		0+0+2	2		30	70	100
	Major	RTUETC3	Organic Farming	4	3+0+0	3		30	70	100
		RTUELC3	Lab- Organic Farming		0+0+2	2		30	70	100
	Minor	RTUETG1	Organic Farming	4	2+0+0	2		30	70	100
		RTUELG1	Lab- Organic Farming		0+0+2	2		30	70	100
	Internship	RTUINT1	-	-		2		30	70	100

							Total	**270**	**630**	**900**
VI	Major	RTUFTC1	Land Surveying, Levelling and Drawing	4	3+0+0	3	19	30	70	100
		RTUFLC1	Lab- Land Surveying, Levelling and Drawing		0+0+2	2		30	70	100
	Major	RTUFTC2	Rural Social Structure and Planning	4	3+0+0	3		30	70	100
		RTUFLC2	Lab- Rural Social Structure and Planning		0+0+2	2		30	70	100
	Major	RTUFTC3	Rural Health Care	4	3+0+0	3		30	70	100
		RTUFLC3	Lab- Rural Health Care		0+0+2	2		30	70	100
	Minor	RTUFTG1	Nursery Technology	4	2+0+0	2		30	70	100
		RTUFLG1	Lab- Nursery Technology		0+0+2	2		30	70	100
							Total	**270**	**630**	**900**
The students wish to exit after sixth 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	RTUGTC1	Introduction to Remote sensing and GIS	5	3+0+0	3	19	30	70	100
		RTUGLC1	Lab- Introduction to Remote sensing and GIS		0+0+2	2		30	70	100
	Major	RTUGTC2	Introduction to Medicinal and Aromatic Plants	5	3+0+0	3		30	70	100
		RTUGLC2	Lab- Introduction to Medicinal and Aromatic Plants		0+0+2	2		30	70	100
	Major	RTUGTC3	Food Preservation Technology	5	3+0+0	3		30	70	100
		RTUGLC3	Lab- Food Preservation Technology		0+0+2	2		30	70	100
	Minor	RTUGTG1	Food Preservation Technology	4	3+0+0	3		30	70	100
		RTUGLG1	Food Preservation Technology		0+0+1	1		30	70	100
							Total	**240**	**560**	**800**
VIII	Major	RTUHTC1	Research Methodology and Ethics	5	3+0+0	3	21	30	70	100
		RTUHLC1	Lab- Research Methodology and		0+0+2	2		30	70	100

			Ethics							
	Minor	RTUHTG1	Herbal Drug Formulation	5	3+0+0	3		30	70	100
		RTUHLG1	Lab- Herbal Drug Formulation		0+0+1	1		30	70	100
	*Research Project/Dissertation	RTUHDC1				12		*300	**100	400
	• Evaluation of thesis (Internal), ** Viva-voce (External)						**Total**	**420**	**380**	**800**
			(II) Course structure for UG (Honors)							
VII	Major	RTUGTC1	Introduction to Remote sensing and GIS	5	3+0+0	3	20	30	70	100
		RTUGLC1	Lab- Introduction to Remote sensing and GIS		0+0+2	2		30	70	100
	Major	RTUGTC2	Introduction to Medicinal and Aromatic Plants	5	3+0+0	3		30	70	100
		RTUGLC2	Lab- Introduction to Medicinal and Aromatic Plants		0+0+2	2		30	70	100
	Major	RTUGTC3	Crop Production Technology	5	3+0+0	3		30	70	100
		RTUGLC3	Lab- Crop Production Technology		0+0+2	2		30	70	100
	Minor	RTUGTG1	Introduction to Medicinal and Aromatic Plants	5	3+0+0	3		30	70	100
		RTUGLG1	Lab- Introduction to Medicinal and Aromatic Plants		0+0+1	1		30	70	100
	Seminar	RTUGSA1	-	-		1		30	70	100
							Total	**270**	**630**	**900**
VIII	Major	RTUHTC1	GIS Application and Scope	5	3+0+0	3	20	30	70	100
		RTUHLC1	Lab-GIS Application and Scope		0+0+2	2		30	70	100
	Major	RTUHTC2	Introduction to Traditional Systems of Medicine	5	3+0+0	3		30	70	100
		RTUHLC2	Lab- Introduction to Traditional Systems of Medicine		0+0+2	2		30	70	100
	Minor	RTUHTG1	Natural Product and Processing Techniques	5	3+0+0	3		30	70	100

		RTUHLG1	Lab- Natural Product and Processing Techniques		0+0+1	1		30	70	100
	Minor	RTUHTG2	Fundamentals of Entrepreneurship	5	3+0+0	3		30	70	100
		RTUHLG2	Tutorial- Fundamentals of Entrepreneurship		0+0+1	1		30	70	100
	Seminar	RTUHSA1	-	-		2		30	70	100
							Total	**270**	**630**	**900**

Program Outcomes (POs) of Undergraduate Program

POs of B. Sc. Rural Technology

PO1. Knowledge and Awareness: Adequate information on basics and advance fields of the core and applied subjects will be provided to enhance knowledge and awareness so that a professionalism may be developed among students.

PO2. Problem solving and Critical Thinking: To enable the students to take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO3. Effective Communication and Social Interactions: Speak, read, write and listen clearly individually and through electronic media in English, Hindi and/ or in any one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology. Realize and respect of views of others, mediate disagreements and cooperate to reach conclusions in group settings.

PO4. Effective Citizenship and Ethics: To groom the students in such a way that they perform empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering. Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO5. Environmental awareness and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO6. Skill Development and Employability: To generate special skill through vocational training, workshops, field visits, entrepreneurial and career development courses so that students may generate employability for themselves and others.

PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological, socio-economic and socio-cultural improvements.

Program Specific Outcomes

PSOs of B. Sc. Rural Technology

PSO1. Understand nature and basic concept and applied aspects of Organic Manure Production Techniques, Elementary Biology, Soil and Fertilizers, Horticulture and Landscaping, and Organic Farming, Microbial Technology, Dairy Management and Products, Plant Propagation and Nursery Management, Herbal Production Techniques, Sericulture, Basics of Mushroom Production, Aquaculture, Integrated Pest Management, Indigenous Art and Crafts,

PSO2. Understand nature and basic concept and applied aspects of Rural Social Structure and Planning, Poultry Production Techniques, Plant Morphology and Reproduction, Economic Botany, Rural Entrepreneurship and Management, Goat and Pig Production Techniques, Lac and Honey Production, Remote Sensing and GIS, Medicinal Plants, and Natural Products Management, Food preservations.

PSO3. Analyze the relationships among animals, plants, microbes and use of Engineering and Computer Sciences for socio-economic development in rural areas.

PSO4. Perform procedures as per laboratory standards in the areas of Organic Farming, Dairy, Mushroom, Poultry, and Herbal Production, Sericulture, Aquaculture, Art and Crafts, Plant Propagation and Nursery Management, Remote Sensing and GIS.

PSO5. Understand the applications of biological and computer sciences in Apiculture, Aquaculture, Agriculture, Medicine, Remote Sensing and GIS, Rural Engineering and Rural Planning.

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 conditions of farmers during various periods.
3. Understand indigenous technical knowledge.
4. Understand structure of Indian society and their livelihood.
5. Understand rural technology, entrepreneurial and skill development.

Course:

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 various periods: 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 and Program Specific Outcomes:

COs	**POs**						**PSOs**				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	1	2	3	3	-	-	3	1
CO2	3	3	1	1	2	3	3	-	-	3	1
CO3	3	3	1	1	2	3	3	-	-	3	1
CO4	3	3		3	2	3	3	-	-	1	1
CO5	3	3		1	2	3	3	-	-	1	1

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

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

Course outcomes

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

1. Connect basics of evolution of man and agriculture through various farm visits.
2. Handson experience through model preparations.
3. Be aware about success story, innovations of the farmers.
4. Understand structure of Indian society and their livelihood.
5. Understand rural technology, entrepreneurial and skill development.

Course:

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.

Suggested Readings:

Handbook of agriculture, ICAR
Farmers' handbook on basic agriculture

Course Outcomes and their mapping with Program Outcomes and Program Specific Outcomes:

COs	**POs**						**PSOs**				
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	1	2	3	3	-	-	3	1
CO2	3	3	1	1	2	3	3	-	-	3	1
CO3	3	3	1	1	2	3	3	-	-	3	1
CO4	3	3		3	2	3	3	-	-	1	1
CO5	3	3		1	2	3	3	-	-	1	1

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

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. Understand the process of orchard establishment and its management knowledge.
3. Adopt horticulture as entrepreneurship.
4. Understand principles of landscaping and their types.
5. Acquire landscaping skills for entrepreneurship.

Course:

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.

Floriculture: 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.

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 Husbandry – J. S. Yadav
Fruit Production- K. N. Dubey
Modern Oleri and Floriculture – G. S. Sainey

Continue…

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	2	3	3	2	2	3	1
CO2	3	3	1	2	2	3	3	2	2	3	1
CO3	3	3	1	2	2	3	3	2	2	3	1
CO4	3	3	1	2	2	3	3	2	2	3	1
CO5	3	3	1	2	2	3	3	2	2	3	1

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

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

Course Outcomes

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

1. Identify garden equipment and its importance.
2. Prepare and maintain gardens.
3. Adopt horticulture as entrepreneurship.
4. Understand principles of landscaping and their types.
5. Acquire Bonsai preparation skills and terrarium culture for entrepreneurship.

Course:

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 Husbandry – J. S. Yadav
Fruit Production- K. N. Dubey
Modern Oleri and Floriculture – G. S. Sainey

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	2	3	3	2	2	3	1
CO2	3	3	1	2	2	3	3	2	2	3	1
CO3	3	3	1	2	2	3	3	2	2	3	1
CO4	3	3	1	2	2	3	3	2	2	3	1
CO5	3	3	1	2	2	3	3	2	2	3	1

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

SYLLABUS as per NEP- 2020 B. Sc. I SEMESTER		
Course Title: DAIRY MANAGEMENT AND PRODUCTS		
Course Code: SECRT01	**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. Understand various diseases and their management in cows and buffaloes.
5. Prepare various dairy products and enhance their skill for establishment of Dairy.

Course:
Different Breeds: 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 and 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

Continue…

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	1	3	3	3	2	2	3	1
CO2	3	3	1	1	3	3	3	2	2	3	1
CO3	3	3	1	1	3	3	3	2	2	3	1
CO4	3	3	1	1	3	3	3	2	2	3	1
CO5	3	3	1	1	3	3	3	2	2	3	1

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

Course Title: LAB-DAIRY MANAGEMENT AND PRODUCTS		
Course Code: SECRT02	**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.
5. Prepare various dairy products and enhance their skill for establishment of Dairy.

Course:

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.

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 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	1	3	3	3	2	2	3	1
CO2	3	3	1	1	3	3	3	2	2	3	1
CO3	3	3	1	1	3	3	3	2	2	3	1
CO4	3	3	1	1	3	3	3	2	2	3	1
CO5	3	3	1	1	3	3	3	2	2	3	1

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

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. Identify the different breeds of poultry birds and their nutritional management.
2. Understand the Poultry farm management.
3. Understand breeding of chicken and assessment of quality of poultry products.
4. Carry out poultry health management.
5. Establish entrepreneurship in this field.

Course:

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.

Suggested Readings:

Amlendu Chakerbarti: Handbook of Animal Husbandary"

Jagdish Prasad: Poultry Production and Management"

R. A. Singh: Poultry 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	1	2	3	-	3	3	3	1
CO2	3	3	1	1	2	3	-	3	3	3	1
CO3	3	3	1	1	2	3	-	3	3	3	1
CO4	3	3	1	1	2	3	-	3	3	3	1
CO5	3	3	1	1	2	3	-	3	3	3	1

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

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 commercial poultry systems and deliver routine husbandry procedures and poultry production performance.
2. Acquire knowledge of various instruments/ equipment used in poultry production.
3. Learn about the poultry farming, site selection, and accommodation arrangements, handling of birds, feed and water.
4. Gain skill to maintain the health of birds from diseases, symptoms, culling, vaccination etc.
5. Establish themselves as poultry- based entrepreneur.

Course:

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 equipment.
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

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	1	3	3	3	1
CO2	3	3	1	-	2	3	1	3	3	3	1
CO3	3	3	1	-	2	3	1	3	3	3	1
CO4	3	3	1		2	3	1	3	3	3	1
CO5	3	3	1		2	3	1	3	3	3	1

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

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. Understand fermentation technology.
4. Learn economically important microorganisms and their use in bakery and dairy.
5. Understand the role of microorganisms in organic matter decomposition.

Course:

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 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	1	2	3	3	1	1	3	1
CO2	3	3	1	1	2	3	3	1	1	3	1
	3	3	1	1	2	3	3	1	1	3	1
CO4	3	3	1	1	2	3	3	1	1	3	1
	3	3	1	1	2	3	3	1	1	3	1

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

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. Acquire skill to handle instruments used in microbial techniques.
2. Know about the types of microorganisms in and around humans and metabolism and mechanism of microbial life.
3. Learn important and diversified groups of micro-organisms in nature and their classification.
4. Understand interactions within the microbial communities and between microorganism and plants/ animals.
5. Knowledge about use of microbiological equipment and observations.

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.

Suggested Readings:

7. A text book of microbiology- R.C. Dubey and D.K. Maheshwari
8. Industrial Microbiology- A.H. Patel
9. Microbiology Fundamentals and Application- S.S. Purohit
10. General Microbiology- Powar and Daghinawala
11. Microbiology A System Approach- M.K. Cowan
12. Microbiology- L.M. Prescott

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	1	2	3	3	2	1	3	1
CO2	3	3	1	1	2	3	3	2	1	3	1
CO3	3	3	1	1	2	3	3	2	1	3	1
CO4	3	3	1	1	2	3	3	2	1	3	1
CO5	3	3	1	1	2	3	3	2	1	3	1

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

SYLLABUS as per NEP- 2020 B.Sc. II SEMESTER		
Course Title: HERBAL PRODUCTION TECHNOLOGY		
Course Code: SECRT03	**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 about dosage forms in Ayurvedic system.
2. Understand vast medicinal flora and their scientific role.
3. Learn the use of various apparatus in preparation of herbal drugs.
4. Gain technical confidence and skills to develop herb- based drugs.
5. Understand herbal production techniques to develop various drugs.

Course:

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

Apparatus: Dolyantram, Svedaniyantram, Dhupayantram, Patanayantram, Adhaspatanyantram, Tirgakapatanyantram, Vidhyadharyantum, Putas, Mahaputa, Musha, Hamspakayantram.

Utilization 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.

Reference Books

Medicinal plants of India Vol 1 & 2 ICAR by Kirtikar & Basu.
Indigenous medicinal specialties: U.S. Narayan Rao
Useful plant of Neotropical origin: Heing Brucher
Cultivation and utilization of Aromatic plants: C.K. Atal and B.M. Kapoor
Pharmacognocy - Trease & Evans.
Pharmacognocy- Gokhale, Kokate & Purohit
Cultivation and Utilization of Aromatic plants - L.K. Atal & B.M. Kapoor.
Professional Pharmacy - Jain & Sharma.
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph
Medicinal Plants- A. Kurian and M.A. Sankar
Medicinal Plants Ethnobotanical Approach- P.C. Trivedi
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph

Continue…

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

Course Title: LAB- HERBAL PRODUCTION TECHNOLOGY		
Course Code: SECRT04	**Credit:01**	**Marks: 30 + 70**

Course Outcomes

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

1. Understand equipment used in preparation of *Ayurvedic* formulations
2. Gain knowledge about the selection and processing of herbs as raw materials for herbal drug preparation.
3. Prepare drug formulations regularly used in *Ayurveda*
4. Learn about principles of traditional medicine systems with method of preparation and standardization of crude and *Ayurvedic* formulation.
5. Find job opportunities on the basis of knowledge of medicinal plants.

Course:

1. Study of equipment used in preparation of *Ayurvedic* formulations.
2. Preparation of *Triphala/ Sitopaladi/ Lawanbhaskar churna*
3. Preparation of tooth powder.
4. Preparation of Hair oil/pain killer oil.
5. Preparation of herbal products.
6. Preparation of *Awaleha*.

Reference Books

Medicinal plants of India Vol 1 & 2 ICAR by Kirtikar & Basu.
Indigenous medicinal specialties: U.S. Narayan Rao
Useful plant of Neotropical origin: Heing Brucher
Cultivation and utilization of Aromatic plants: C.K. Atal and B.M. Kapoor
Pharmacognocy - Trease & Evans.
Pharmacognocy- Gokhale, Kokate & Purohit
Cultivation and Utilization of Aromatic plants - L.K. Atal & B.M. Kapoor.
Professional Pharmacy - Jain & Sharma.
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph
Medicinal Plants- A. Kurian and M.A. Sankar
Medicinal Plants Ethnobotanical Approach- P.C. Trivedi
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph

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	1	2	3	3	3	3	3	1
CO2	3	3	1	1	2	3	3	3	3	3	1
CO3	3	3	1	1	2	3	3	3	3	3	1
CO4	3	3	1	1	2	3	3	3	3	3	1
CO5	3	3	1	1	2	3	3	3	3	3	1

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

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 fibres and get knowledge of diseases and pests management of host plant.
3. Gain technical skills for establishment of orchards for silk moth rearing.
4. Understand reeling techniques of silk.
5. Obtain job opportunities in the public, private and government sectors.

Course:

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.

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).

Continue…

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	1	3	3	3	1	1	3	1
CO2	3	3	1	1	3	3	3	1	1	3	1
CO3	3	3	1	1	3	3	3	1	1	3	1
CO4	3	3	1	1	3	3	3	1	1	3	1
CO5	3	3	1	1	3	3	3	1	1	3	1

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

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. Understand variety of host plants for silk moth rearing.
2. Gain skill of plantation and propagation techniques for host plants.
3. Understand mulberry cultivation and carry forward to field.
4. Understand the procedure of silkworm egg production and support grainage activity.
5. Acquire knowledge and develop skill in silkworm rearing and support silkworm farming.

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:

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).

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	1	3	3	3	1	1	3	1
CO2	3	3	1	1	3	3	3	1	1	3	1
CO3	3	3	1	1	3	3	3	1	1	3	1
CO4	3	3	1	1	3	3	3	1	1	3	1
CO5	3	3	1	1	3	3	3	1	1	3	1

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

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.
5. Create employability and establish themselves as entrepreneur in energy sector.

Course:

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-fuels: Properties, characteristics, petro crops, biodiesel, economic feasibility of biodiesel.

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

Suggested Readings:

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

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	1	3	3	1	3	1	3	2
CO2	3	3	1	1	3	3	1	3	1	3	2
CO3	3	3	1	1	3	3	1	3	1	3	2
CO4	3	3	1	1	3	3	1	3	1	3	2
CO5	3	3	1	1	3	3	1	3	1	3	2

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

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.
5. Be skillful in record keeping and documentation.

Course:

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

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	1	3	3	1	3	1	3	2
CO2	3	3	1	1	3	3	1	3	1	3	2
CO3	3	3	1	1	3	3	1	3	1	3	2
CO4	3	3	1	1	3	3	1	3	1	3	2
CO4	3	3	1	1	3	3	1	3	1	3	2
CO5	3	3	1	1	3	3	1	3	1	3	2

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

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 fibres and get knowledge of diseases and pests management of host plant.
3. Gain technical skills for establishment of orchards for silk moth rearing.
4. Understand reeling techniques of silk.
5. Obtain job opportunities in the public, private and government sectors.

Course:

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.

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).

Continue…

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	1	3	3	3	1	1	3	1
CO2	3	3	1	1	3	3	3	1	1	3	1
CO3	3	3	1	1	3	3	3	1	1	3	1
CO4	3	3	1	1	3	3	3	1	1	3	1
CO5	3	3	1	1	3	3	3	1	1	3	1

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

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. Understand variety of host plants for silk moth rearing.
2. Gain skill of plantation and propagation techniques for host plants.
3. Understand mulberry cultivation and carry forward to field.
4. Understand the procedure of silkworm egg production and support grainage activity.
5. Acquire knowledge and develop skill in silkworm rearing and support silkworm farming.

Course:

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:

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).

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	1	3	3	3	1	1	3	1
CO2	3	3	1	1	3	3	3	1	1	3	1
CO3	3	3	1	1	3	3	3	1	1	3	1
CO4	3	3	1	1	3	3	3	1	1	3	1
CO5	3	3	1	1	3	3	3	1	1	3	1

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

SYLLABUS as per NEP- 2020 B. Sc. III SEMESTER		
Course Title: BASICS OF MUSHROOM CULTIVATION AND PRODUCTION		
Course Code:SECRT05	**Credit: 04**	**30+70**
SEC/ Level 1	**L2+P2**	**Marks:100**

Course Outcomes

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

1. Identify edible and non-edible mushrooms.
2. Learn mushroom production techniques and their management.
3. Build up the efficiency of mushroom production, management and marketing.
4. To be skill full in post-harvest handling of mushrooms.
5. Create employability opportunities in mushroom sector.

Course:

Introduction: Distribution, History and scope of Mushrooms, Characteristic features of Basidiomycotina fungi.

Identification: of commonly grown mushroom species, Edible mushroom and their characteristics, Nutritional value of Mushrooms, Features of poisonous mushrooms, Medicinal mushrooms and their properties.

Spawn production technique: Equipments, mother culture preparation technique and their management.

Production Techniques: of Oyster Mushroom, Paddy Straw Mushroom, White Button Mushroom and White Milkey Mushroom.

Post-harvest handling: of mushrooms, Problems related to mushroom production, Management of pests and diseases.

Suggested Readings:

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

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	1	2	3	3	1	1	3	1
CO2	3	3	1	1	2	3	3	1	1	3	1
CO3	3	3	1	1	2	3	3	1	1	3	1
CO4	3	3	1	1	2	3	3	1	1	3	1
CO5	3	3	1	1	2	3	3	1	1	3	1

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

Course Title: LAB-BASICS OF MUSHROOM CULTIVATION AND PRODUCTION		
Course Code: SECRT06	**Credit:01**	**Marks:30+70**

Course Outcomes

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

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

Course:

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

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	1	2	3	3	1	1	3	1
CO2	3	3	1	1	2	3	3	1	1	3	1
CO3	3	3	1	1	2	3	3	1	1	3	1
CO4	3	3	1	1	2	3	3	1	1	3	1
CO5	3	3	1	1	2	3	3	1	1	3	1

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

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 Outcomes:
On completion of this course, the students will be able to:
1. Understand non timber forest products and their importance in economy.
2. Develop understanding of classification of grasses of economic importance.
3. Identify the common natural products of plant origin and its production and processing.
4. Understand strategies of management of natural products.
5. Generate employability and self-entrepreneurship in natural product management.

Introduction: 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: 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.

Suggested Readings

Non – Timber Forest Product – S. Negi.

Forest Non – Wood Resources – A.P. Dewadi.
Indian Forest Utilization Vol.- II, FRI Edition

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

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.
2. Understand the need- based development of products.
3. Consider issues around indigenous knowledge, traditional use, cultural perspectives and ownership of native flora and fauna.
4. Gain practical skills in the extraction, purification and analysis of natural products.
5. To be skillful of handling natural products for sustainable development.

Course:

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

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

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 Outcomes:
On completion of this course, the students will be able to:
1. Identify different breeds of goats and pigs and understand their feeding management.
2. Understand housing and health management of goats and pigs.
3. Understand general caring practices needed for goats and pigs.
4. Understand health management of goats and pigs.
5. Generate employment for themselves and others.

Course:
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.

Suggested Readings:
Amlendu Chakrabarti Handbook of Animal Husbandry"
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

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

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. Identify different breeds of goats and pigs.
2. Understand housing, feeding and health management of goats and pigs.
3. Understand general caring practices needed for goats and pigs.
4. Understand the importance of record keeping.
5. Generate employment for themselves and others.

Course:

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

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

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**

Course Outcomes

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

1. Identify various species of honey bees and understand the basics of apiculture.
2. Understand various bee products and their uses.
3. Understand the life cycle of lac insect and its various hosts for lac culture.
4. Be skillful in preparation of various lac products for various purposes.
5. Create employment for themselves and others in apiculture and lac culture sector.

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.

Suggested Readings:

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.

Continue…

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

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. Identify various species of honey bees and lac insects and their host plants.
2. Understand equipment used in apiary and lac production
3. Understand the methods and practices of apiculture and lac culture.
4. Practical aspects of various products of apiculture and lac production.
5. Create employment for themselves and others in apiculture and lac culture sector.

Course:

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.

Suggested Readings

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

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

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**

Course Outcomes

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

1. Identify various species of honey bees and understand the basics of apiculture.
2. Understand various bee products and their uses.
3. Understand the life cycle of lac insect and its various hosts for lac culture.
4. Be skillful in preparation of various lac products for various purposes.
5. Create employment for themselves and others in apiculture and lac culture sector.

Course:

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.

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.

Continue…

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

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:

1. Identify various species of honey bees and lac insects and their host plants.
2. Understand equipment used in apiary and lac production
3. Understand the methods and practices of apiculture and lac culture.
4. Practical aspects of various products of apiculture and lac production.
5. Create employment for themselves and others in apiculture and lac culture sector.

Course:

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:

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

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

SYLLABUS as per NEP 2020 B. Sc. V SEMESTER		
Course Title: SOIL AND NUTRIENT MANAGEMNET		
Course Code: RTUETC1	**Credit: 05**	**30+70**
MAJOR/ LEVEL-4	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Understand types of rocks, minerals and soil formation.
2. Understand about types of soil and soil profile.
3. Evaluate nutrients in plants and their management.
4. Understand pattern of soil fertilizers and application of bio fertilizers.
5. Be skillful to work as consultant / advisor for soil nutrients management.

Course:

Rocks and Minerals: Rocks and its classification, weathering of rocks, soil formation-physical, chemical and biological soil forming process.

Soil: Introduction, definition, components of soil, soil formation process, soil properties, soil profile, types of soil, soil aeration, factor affecting soil aeration, soil water and soil water movement, soil moisture measurement, availability of soil water,

Soil fertility: Concept, and historical development of soil fertility, importance of soil fertility, factor affecting soil fertility, soil productivity, factor affecting soil productivity.

Plant nutrients: Definition and types of plant nutrients, classification of essential nutrients, deficiency and toxicity symptoms of essential nutrients, consumption of nutrients and nutrient interaction.

Soil fertility evaluation: Plant analysis tissue test, total analysis, biological tests- field test, Indicator plants, microbiological test, soil testing method, modern approaches of soil fertility evaluation and fertilizer recommendation.

Soil Fertilizers: Classification of fertilizer, basic principle of fertilizer application, Integrated Plant Nutrient Management (IPNM), Preparation of a biofertilizers- *Azolla*, Blue Green Algae (BGA).

Suggested Readings:

Dilip Kumar Das- Introductory Soil Science
Dr. N. L. Sharma & Dr. T. B. Singh- Mrida Vigyan Ayum Khad Urvark
S.S. Reddy-Principles of Agronomy-
Das- Manures and fertilizers
Basak- Fertilizers A Text Book-
Gustafson- Handbook of fertilizers
Hand book of Fertilizer Association of India, New Delhi, 1998.
Slack A.V- Chemistry & Technology of Fertilizers, Interscience, New York, 1967.
N S Subba Rao-Bio fertilizers in Agriculture, Oxford & IBH Publishing Company

Continue…

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	1	2	3	3	1	1	3	1
CO2	3	3	1	1	2	3	3	1	1	3	1
CO3	3	3	1	1	2	3	3	1	1	3	1
CO4	3	3	1	1	2	3	3	1	1	3	1
CO5	3	3	1	1	2	3	3	1	1	3	1

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

Course Title: LAB-SOIL AND NUTRIENT MANAGEMNET		
Course Code: RTUELC1	**Credit:02**	**Marks:30 + 70**

Course Outcomes

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

1. Understand various types of soil.
2. To evaluate physico-chemical variables of soil for soil quality.
3. Understand essential nutrients, soil fertility, nutrient transformations in soil.
4. Learn manures, fertilizers and soil fertility management.
5. Be skillful to work as consultant / advisor for soil nutrients management.

Course:

1. Study of different types of soil.
2. Measurement of soil moisture, pH, bulk and particle density.
3. Identification of various fertilizers.
4. Calculation of fertilizers doses for crops.
5. To study about green manuring.
6. Determination of soil-N, P, K, and other nutrients

Suggested Readings:
Dilip Kumar Das- Introductory Soil Science
Dr. N. L. Sharma & Dr. T. B. Singh- Mrida Vigyan Ayum Khad Urvark
Das- Manures and fertilizers
Basak- Fertilizers A Text Book-
Gustafson- Handbook of fertilizers
Hand book of Fertilizer Association of India, New Delhi, 1998.
Slack A.V- Chemistry & Technology of Fertilizers, Inter Science, New York, 1967.
N S Subba Rao-Bio fertilizers in Agriculture, Oxford & IBH Publishing Company

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	1	2	3	3	1	1	3	1
CO2	3	3	1	1	2	3	3	1	1	3	1
CO3	3	3	1	1	2	3	3	1	1	3	1
CO4	3	3	1	1	2	3	3	1	1	3	1
CO5	3	3	1	1	2	3	3	1	1	3	1

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

SYLLABUS as per NEP 2020 B.Sc. V SEMESTER		
Course Title: WATERSHED MANAGEMENT		
Course Code: RTUETC2	**Credit: 05**	**30+70**
MAJOR/ LEVEL-4	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Learn the soil and water conservation techniques.
2. Understand knowledge about watershed management.
3. Promote soil and water conservation in the society.
4. Understand application of remote sensing & GIS in watershed management.
5. Be skillful to work as consultants/ advisor Watershed Management

Introduction to Watershed: Definition, Types, land capability classification, and characteristics of watershed. Watershed management- Concepts, objectives, factor affecting, planning and execution and study of water basin.

Hydrological cycle: Rainfall and its measurement, ground water recharge, and factor affecting runoff, water conservation and recycling.

Concept of land and water management: factor affecting erosion, types of erosion, runoff erosivity factor, erodibility factor, Soil Loss Equation, and soil and water conservation practices.

Water harvesting structures: Roof water harvesting, Percolation tank, Contour trench, Check dam, Stop dam, NADIS, KHADIM, Gabian structure, and Gully control.

Role of remote sensing and GIS in watershed management: Introduction to integrated watershed management programme and their impact, application of Remote Sensing & GIS in watershed management.

Suggested Readings:

Integrated watershed management: Rajesh Rajora
Watershed management: E.M. Tidema
Soil erosion and conservation: R.P. Tripathi and S.P. Singh
Land and Water Management: V.V.N. Murti

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	1	2	3	1	3	3	3	2
CO2	3	3	1	1	2	3	1	3	3	3	2
CO3	3	3	1	1	2	3	1	3	3	3	2
CO4	3	3	1	1	2	3	1	3	3	3	2
CO5	3	3	1	1	2	3	1	3	3	3	2

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

Course Title: LAB- WATERSHED MANAGEMENT		
Course Code: RTUELC2	**Credit:02**	**Marks:30 + 70**

Course Outcomes

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

1. Understand the concepts of watershed management.
2. Understand effect watershed on land, water and ecosystem resources.
3. Able to develop control and mitigation techniques for watershed problems.
4. Able to analyze the public policies and practices of watershed planning.
5. Be skillful to work as consultants/ advisor Watershed Management

Course:

1. Visit to watershed area and identification of problems.
2. Preparation of various models for watershed management.
3. Watershed Map preparation through remote sensing.

Suggested Readings:

Integrated watershed management: Rajesh Rajora
Watershed management: E.M. Tidema
Soil erosion and conservation: R.P. Tripathi and S.P. Singh
Land and Water Management: V.V.N. Murti

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	1	2	3	1	3	3	3	2
CO2	3	3	1	1	2	3	1	3	3	3	2
CO3	3	3	1	1	2	3	1	3	3	3	2
CO4	3	3	1	1	2	3	1	3	3	3	2
CO5	3	3	1	1	2	3	1	3	3	3	2

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

SYLLABUS as per NEP- 2020 B. Sc. V SEMESTER		
Course Title: ORGANIC FARMING		
Course Code: RTUETC3	**Credit: 05**	**30+70**
MAJOR/ LEVEL-4	**L3+P2**	**Marks:100**

Course outcomes

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

1. Understand the concepts of organic farming.
2. Understand about different components of organic farming and produce organic crop.
3. Understand organic crop production management.
4. Understand the organic farming certification.
5. Create employability opportunities in organic farming.

Course:

Organic farming: Meaning, concept, definition, types of organic farming and benefits of organic farming. Principle of organic farming. Scope and present status of organic farming; India and Chhattisgarh.

Components of Organic farming: Organic manure, green manure, animal-based manure, agro industry based manure, crop rotation, biological management, Bio-fertilizers.

Organic crop management: Integrated pest management (IPM), integrated disease management (IDM), integrated nutrient management (INM), integrated water management (IWM), integrated weed management (IWM).

Organic crop production practice: Rice, Wheat, Pigeon pea, plantation crops like Mango and Guava.

Organic farming Certification: Policies and incentive of organic production, Agencies and institution related to organic farming, procedures of certification for organic farming.

Suggested Readings

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	1	2	3	1	3	3	3	2
CO2	3	3	1	1	2	3	1	3	3	3	2
CO3	3	3	1	1	2	3	1	3	3	3	2
CO4	3	3	1	1	2	3	1	3	3	3	2
CO5	3	3	1	1	2	3	1	3	3	3	2

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

Course Title: LAB- ORGANIC FARMING		
Course Code: RTUELC3	**Credit:02**	**Marks: 30+70**

Course Outcomes

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

1. Understand the concepts of organic farming.
2. Understand about different components of organic farming and produce organic crop.
3. Understand organic crop production management.
4. Understand the organic farming certification.
5. Create employability opportunities in organic farming.

Course:

1. To study the components of organic farming.
2. To study the production methods of organic manures.
3. To study the methods of application of organic manures.
4. To study the IPM, IDM, IMM and IWM for organic farming.
5. To study the certification process of organic farming.

Suggested Readings

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	1	2	3	1	3	3	3	2
CO2	3	3	1	1	2	3	1	3	3	3	2
CO3	3	3	1	1	2	3	1	3	3	3	2
CO4	3	3	1	1	2	3	1	3	3	3	2
CO5	3	3	1	1	2	3	1	3	3	3	2

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

SYLLABUS as per NEP- 2020 B. Sc. V SEMESTER		
Course Title: ORGANIC FARMING		
Course Code: RTUETG1	**Credit: 04**	**30+70**
MINOR/ LEVEL-4	**L2+P2**	**Marks:100**

Course Outcomes

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

1. Understand the concepts of organic farming.
2. Understand about different components of organic farming and produce organic crop.
3. Understand organic crop production management.
4. Understand the organic farming certification.
5. Create employability opportunities in organic farming.

Course:

Organic farming: Meaning, concept, definition, types of organic farming and benefits of organic farming. Principle of organic farming. Scope and present status of organic farming; India and Chhattisgarh.

Components of Organic farming: Organic manure, green manure, animal-based manure, agro industry based manure, crop rotation, biological management, Bio-fertilizers.

Organic crop management: Integrated pest management (IPM), integrated disease management (IDM), integrated nutrient management (INM), integrated water management (IWM), integrated weed management (IWM).

Organic crop production practice: Rice, Wheat, Pigeon pea, plantation crops like Mango and Guava.

Organic farming Certification: Policies and incentive of organic production, Agencies and institution related to organic farming, procedures of certification for organic farming.

Suggested Readings

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	1	2	3	1	3	3	3	2
CO2	3	3	1	1	2	3	1	3	3	3	2
CO3	3	3	1	1	2	3	1	3	3	3	2
CO4	3	3	1	1	2	3	1	3	3	3	2
CO5	3	3	1	1	2	3	1	3	3	3	2

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

Course Title: LAB- ORGANIC FARMING		
Course Code: RTUELG1	**Credit:02**	**Marks: 30+70**

Course Outcomes

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

1. Understand the concepts of organic farming.
2. Understand about different components of organic farming and produce organic crop.
3. Understand organic crop production management.
4. Understand the organic farming certification.
5. Create employability opportunities in organic farming.

Course:

1. To study the components of organic farming.
2. To study the production methods of organic manures.
3. To study the methods of application of organic manures.
4. To study the IPM, IDM, IMM and IWM for organic farming.
5. To study the certification process of organic farming.

Suggested Readings

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	1	2	3	1	3	3	3	2
CO2	3	3	1	1	2	3	1	3	3	3	2
CO3	3	3	1	1	2	3	1	3	3	3	2
CO4	3	3	1	1	2	3	1	3	3	3	2
CO5	3	3	1	1	2	3	1	3	3	3	2

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

SYLLABUS as per NEP-2020 B. Sc. VI SEMESTER		
Course Title: LAND SURVEYING, LEVELING AND DRAWING		
Course Code: RTUFTC1	**Credit: 05**	**30+70**
MAJOR/ LEVEL-4	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Learn about basic concepts of surveying.
2. Apply surveying for rural infrastructure development and land reforms.
3. Be skillful in DGPS and GPS for surveying and leveling
4. Learn various drawing techniques.
5. Enhance their surveying skills to generate job opportunities for themselves and others.

Course:

Concept of surveying: Surveying for rural development, objectives, types, units of measurement, instruments used for surveying.

Chain surveying: Introduction, principle and purpose, accessories for chaining, methods, running survey lines, Types of ranging survey, Errors in chaining, Testing and adjustment of chain.

Plane table survey: Introduction, principle and purpose, various equipments used in plane table survey, Method of plane table, Errors in plane table survey and precautions.

Contour: Concept of contour, characteristics of contour; Methods of contouring, various contour map application. Concept of leveling, level surface, Differential Global Positioning System (DGPS) and Global Positioning System (GPS).

Drawing techniques: Introduction to various drawing techniques, instruments and accessories used for drawing, Sizes of drawing sheets and their layouts, Lettering techniques and printing.

Suggested Readings:

Arora K.R., Surveying Vol. I & II, Standard Book House, Delhi
Kanitkar T.P., Surveying & Levelling Vol. I & II, Pune Vidyarthi Griha Prakashan, Pune
Basak P.N., Surveying & Leveling, Tata Mc Graw – Hill Publishing Co. Ltd., Delhi.
Agarwal G.D., Surveying Vol. I & II, Unitech Publishers, Lucknow
Dass G., Surveying Vol. I & II, Nav Bharat Prakashan, Meerut.
Punmia B.C., Surveying Vol. I & II, Laxmi Publications (P) Ltd. New Delhi
Duggal S.K., Surveying Vol. I & II, New Age International Publishers New Delhi.
Chandra A.M., Surveying Problem Solving with Theory & Objective Type Questions, New Age International Publishers New Delhi.

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

Course Title: LAB- LAND SURVEYING, LEVELING AND DRAWING		
Course Code: RTUFLC1	**Credit:02**	**Marks: 30 + 70**

Course Outcomes

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

1. Understand the basic surveying instruments and techniques.
2. Apply skills in using surveying instruments and analyze data.
3. Apply skills to conduct traverse survey and to find the area.
4. Understand numerical related to error in management.
5. Create employability opportunities in land surveying, leveling and drwawing

Course:

1. To study about the instruments used in chain survey.
2. To study about the conventional signs and symbol used in chain survey.
3. Calculation of area by using chain survey.
4. To study about the field book.
5. Calculation of area by using plane table survey by radiation method.
6. Numerical related to the error in measurement.
7. Chain survey for the measurement of the area.
8. Instrument related to the plane table survey.

Suggested Readings:

Arora K.R., Surveying Vol. I & II, Standard Book House, Delhi
Kanitkar T.P., Surveying & Levelling Vol. I & II, Pune Vidyarthi Griha Prakashan, Pune
Basak P.N., Surveying & Leveling, Tata Mc Graw – Hill Publishing Co. Ltd., Delhi.
Agarwal G.D., Surveying Vol. I & II, Unitech Publishers, Lucknow
Dass G., Surveying Vol. I & II, Nav Bharat Prakashan, Meerut.
Punmia B.C., Surveying Vol. I & II, Laxmi Publications (P) Ltd. New Delhi
Duggal S.K., Surveying Vol. I & II, New Age International Publishers New Delhi.
Chandra A.M., Surveying Problem Solving with Theory & Objective Type Questions, New Age International Publishers New Delhi.

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

SYLLABUS as per NEP- 2020 B. Sc. VI SEMESTER		
Course Title: RURAL SOCIAL STRUCTURE AND PLANNING		
Course Code: RTUFTC2	**Credit: 05**	**30+70**
MAJOR/ LEVEL-4	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Develop the knowledge about rural social structure and planning.
2. Understand rural settlements.
3. Understand about *Panchayti raj* system and other developmental policies and program.
4. Understand pre-independence and post- independence development programs.
5. Be skillful in managing social works as employability opportunities.

Rural sociology: Basic concept and principles of rural sociology and its application in day to day life, social institutions, social stratification, social process, culture and personality, groups and community, social relations and social organizations in rural areas.

Rural settlement: types of settlement pattern. Rural social structure- family, marriage, religion, caste system etc.

Panchayati Raj system: Panchayati Raj system and its implementation, Rural credit and banking- Nationalized bank, Cooperative bank, Non- institutional credit agencies, their types and working.

Historical review of Pre-independence development program: Shantiniketan, Gandhian concept, Nilokheri project, Gurgaon project, Marthandm project, Etawah project and YMCA.

Post independence development programs: Five years plans of India CD, CADP, IRDP, RLEGP, TRYSEM, DWCRA, CAPART, MGNREGA, WDP, NRLM, BRGF. Rural health care program – NRHM, ASHA. Sanitation programs.

Suggested Readings:

1. India's Developing Villages – G. R. Madan
2. Rural Development – G. R. Madan
3. Rural Sociology – A. R. Desai
4. Panchayati Raj institution – G. S. Bal
5. India 2011 (Section – Rural Development)

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	3	3	2	3	1	3	3	3	3
CO2	3	3	3	3	2	3	1	3	3	3	3
CO3	3	3	3	3	2	3	1	3	3	3	3
CO4	3	3	3	3	2	3	1	3	3	3	3
CO5	3	3	3	3	2	3	1	3	3	3	3

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

Course Title: LAB- RURAL SOCIAL STRUCTURE AND PLANNING		
Course Code: RTUFLC2	**Credit:02**	**Marks: 30 + 70**

Course Outcomes

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

1. Inculcate the sensitivity towards ethics, public policies and their responsibilities towards the rural society.
2. Impart better education with values and transformation of knowledge from class room to common man.
3. Understand the rural sociology and social anthropology from rural development perspectives, and characteristics of rural society.
4. Understand the importance of various schemes like MGNREGA in social perspectives.
5. Be skillful in managing social works as employability opportunities.

Course:

1. To study the social stratification.
2. Study of rural development program.
3. To study the rural social and economical structure.
4. Impact analysis of MGNREGA.

Suggested Readings:

1. India's Developing Villages – G. R. Madan
2. Rural Development – G. R. Madan
3. Rural Sociology – A. R. Desai
4. Panchayati Raj institution – G. S. Bal
5. India 2011 (Section – Rural Development)

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	3	3	2	3	1	3	3	3	3
CO2	3	3	3	3	2	3	1	3	3	3	3
CO3	3	3	3	3	2	3	1	3	3	3	3
CO4	3	3	3	3	2	3	1	3	3	3	3
CO5	3	3	3	3	2	3	1	3	3	3	3

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

SYLLABUS as per NEP- 2020 B.Sc. VI SEMESTER		
Course Title: RURAL HEALTH CARE		
Course Code: RTUFTC3	**Credit: 05**	**30+70**
MAJOR/ LEVEL-4	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Understand the health and diseases, their causes and sanitation importance.
2. Aware about the health management.
3. Aware about various communicable diseases, their prevention and control.
4. Understand programs for sanitation and health improvement.
5. Motivate to manage health in community on day to day basis.

Course:

Rural Health: Understanding of health, epidemiology, natural history of diseases, determinants of health, indicators of health.

Rural Health and Nutrition Status: Health and nutrition linkages and status, dietary intake, trends in health and nutrition, factors influencing health and nutrition status.

Rural Health and Communicable Diseases: Understanding communicable diseases, different communicable diseases and etiology of – respiratory infection, water and food borne infections, contact diseases, arthropod borne diseases and zoonosis.

Communicable Diseases: Characteristics of common communicable diseases. Prevention and control of communicable diseases.

Rural Health Management: Health care services- (a) general services, (b) Maternal and child health services (c) services provided under national health program.

Rural Sanitation and hygiene: Government Schemes like, Swachchha Bharat Mission, Nirmal Bharat Abhiyan and Amrut Mission.

Suggested Readings:

Health Care in Rural Areas: J. Cyril Kanmony

Tribal Fertility, Morality and Health Care Oractics: R Mutharayappa

Rural Behavioral Health Care: An Interdisciplinary Guide:B. Handnall Stamm

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	3	3	2	3	1	3	3	3	3
CO2	3	3	3	3	2	3	1	3	3	3	3
CO3	3	3	3	3	2	3	1	3	3	3	3
CO4	3	3	3	3	2	3	1	3	3	3	3
CO5	3	3	3	3	2	3	1	3	3	3	3

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

SYLLABUS as per NEP- 2020 B.Sc. VI SEMESTER		
Course Title: LAB-RURAL HEALTH CARE		
Course Code: RTUFTC3	**Credit: 02**	**30+70**

Course Outcomes

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

1. Aware about various communicable diseases, their prevention and control.
2. Gain awareness about the health care services.
3. Learn about basic rural health management for rural areas.
4. Understand programs for sanitation and health improvement.
5. Motivate to manage health in community on day to day basis.

Course:

1. To identify causative agents of zoonotic diseases.
2. Anthropometric analysis among students for nutritional status.
3. Performance of few hematological and serological endpoints
4. Group discussion on communicable diseases.
5. Visit to nearby PHC/CHC/wellness centers.

Suggested Readings:

Health Care in Rural Areas: J. Cyril Kanmony
Tribal Fertility, Morality and Health Care Oractics: R Mutharayappa
Rural Behavioral Health Care: An Interdisciplinary Guide: B. Handnall Stamm

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	3	3	2	3	1	3	3	3	3
CO2	3	3	3	3	2	3	1	3	3	3	3
CO3	3	3	3	3	2	3	1	3	3	3	3
CO4	3	3	3	3	2	3	1	3	3	3	3
CO5	3	3	3	3	2	3	1	3	3	3	3

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

SYLLABUS as per NEP 2020 B. Sc. VI SEMESTER		
Course Title: NURSERY TECHNOLOGY		
Course Code: RTUFTG1	**Credit: 04**	**30+70**
MINOR/ LEVEL-4	**L2+P2**	**Marks:100**

Course Outcomes

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

1. Understand various plant nurseries and their special functions.
2. Acquire skills about propagation of nursery plants and their handling
3. Calculate recommended dose of pesticide and fertilizers in orchards.
4. Gain technical confidence and skills for management of plant nursery.
5. Work as consultants/ advisor to establish nursery for employment opportunities.

Introduction: Concept, meaning, definitions and Importance of plant nursery, Types and functions of plant nursery, site selection for nursery, physical and financial resources for nursery, nursery expenditure, Cost and profit analysis.

Plantation techniques: Soil analysis, land preparation, pit formation, species selection, planting system, pit filling, preparation of nursery beds and management of mother plants.

Plant propagation, methods: Sexual and Asexual propagation, Vegetative propagation-division, cutting, layering, budding and grafting. Micro-propagation and hardening, plant propagation material, integrated nutrient management, irrigation system, packing and transport of nursery plants.

Planting time and planting methods: Entire plant planting and stump planting, clonal plantation, pre and post activity in plantation, water, nutrients, weeds, disease and pest management of planted plant, Training and pruning practices.

Protected propagation structures: Quonset, Gutter connected, Glass House, plastic film Green House, Rigid Panel Greenhouses and Greenhouse with Double-Layer Covering.

Suggested Readings:

Plantation Forestry: R.K. Luna
Nursery Technology: S.S. Negi
Plant Propagation and Nursery Husbandry: J.S. Yadav
Introductory Horticulture: E.P. Christopher

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	3	3	2	3	1	3	3	3	3
CO2	3	3	3	3	2	3	1	3	3	3	3
CO3	3	3	3	3	2	3	1	3	3	3	3
CO4	3	3	3	3	2	3	1	3	3	3	3
CO5	3	3	3	3	2	3	1	3	3	3	3

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

Course Title: LAB- NURSERY TECHNOLOGY		
Course Code: RTUFLG1	**Credit:02**	**Marks:30+70**

Course Outcomes

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

1. Understand gardening, cultivation, multiplication, raising of seedlings of garden plants.
2. Gain knowledge of new and modern techniques of plant propagation.
3. Understand different technologies like training, pruning for plants in nursery.
4. Understand potting and repotting of plants in nursery.
5. Create employability opportunities in plant nursery for providing material for landscaping/ horticulture and agriculture.

Course:

1. Layout preparation for plant nursery.
2. Sexual and asexual methods of plant propagations; Seed, division, cutting, layering, budding and grafting.
3. Preparation of nursery beds
4. Preparation of planting media.
5. Training and pruning practices in nursery plants.
6. Potting and repotting of nursery plants.
7. Nursery plant management.

Suggested Readings:

Plantation Forestry: R.K. Luna
Nursery Technology: S.S. Negi
Plant Propagation and Nursery Husbandry: J.S. Yadav
Introductory Horticulture: E.P. Christopher

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	3	3	2	3	1	3	3	3	3
CO2	3	3	3	3	2	3	1	3	3	3	3
CO3	3	3	3	3	2	3	1	3	3	3	3
CO4	3	3	3	3	2	3	1	3	3	3	3
CO5	3	3	3	3	2	3	1	3	3	3	3

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

SYLLABUS as per NEP- 2020 B. Sc. VII SEMESTER (HONOURS WITH RESEARCH)		
COURSE TITLE: INTRODUCTION TO REMOTE SENSING AND GIS		
Course Code: RTUGTC1	**Credit: 05**	**30+70**
MAJOR/ LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Obtain knowledge and hands on experience of application of remote sensing.
2. Understand principles behind remote sensing.
3. Aware with applications of remote sensing in rural development.
4. Work with various software of remote sensing and GIS for rural development.
5. Create employability opportunities in remote sensing and GIS applications.

Introduction: Definition of Remote Sensing, Kinds of Remote Sensing, History and development of Remote Sensing in world. Advantages of remote sensing. Real and Ideal Remote Sensing

Energy Sources: Electromagnetic Energy, Electromagnetic Spectrum & Radiation, Scattering, Absorption and Reflectance in Remote Sensing. Spectral reflectance response of different earth surface features, image enhancement.

History of Aerial Remote Sensing: Type of Aerial photograph, Photographic scale, introduction to Photogrammetry, application of photogrammetry in vertical aerial photograph, difference between satellite image and aerial photograph, stereoscope and platform.

Platforms: Kinds of platforms Introduction to Satellite, Polar orbiting, Geosynchronous and GPS Satellites, their functions and importance

Map and Images: Spatial elements in image, classification of maps, Map scale, Spatial referencing system, map projection.

Suggested Readings:

F.F. Sabins: Remote Sensing – Principles & interpretation
Dr. P. Nag, Dr. M. Kudrat: Digital Remote Sensing, Concept Publishing company 1998
P.J. Curran: Principles of Remote Sensing, Longman.
J.A. Richards: Digital Image Processing in Remote Sensing, Springer
F.F. Sabins: Remote Sensing – Principles & interpretation
Lillesand & Keifer: Remote Sensing & Image interpretation

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	3	1	3	3	2	3	3	3	3
CO2	3	3	3	1	3	3	2	3	3	3	3
CO3	3	3	3	1	3	3	2	3	3	3	3
CO4	3	3	3	1	3	3	2	3	3	3	3
CO5	3	3	3	1	3	3	2	3	3	3	3

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

Course Title: LAB- INTRODUCTION TO REMOTE SENSING AND GIS		
Course Code: RTUGLC1	**Credit:02**	**Marks: 30+70**

Course Outcomes

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

1. Identify, analyze and solve geospatial problems.
2. Develop solutions to the growing challenges of Remote Sensing and GIS.
3. Interpret the remotely sensed data.
4. Work with different software related to remote sensing and GIS.
5. Create employability opportunities in remote sensing and GIS applications

Course:

1. To study about toposheet and its component.
2. To study about the map and calculation of map scale
3. To study about different software related to remote sensing
4. Geometric correction.
5. Image processing.

Suggested Readings:

F.F. Sabins: Remote Sensing – Principles & interpretation
Dr. P. Nag, Dr. M. Kudrat: Digital Remote Sensing, Concept Publishing company 1998
P.J. Curran: Principles of Remote Sensing, Longman.
J.A. Richards: Digital Image Processing in Remote Sensing, Springer
F.F. Sabins: Remote Sensing – Principles & interpretation
Lilles and & Keifer: Remote Sensing & Image interpretation

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	3	1	3	3	2	3	3	3	3
CO2	3	3	3	1	3	3	2	3	3	3	3
CO3	3	3	3	1	3	3	2	3	3	3	3
CO4	3	3	3	1	3	3	2	3	3	3	3
CO5	3	3	3	1	3	3	2	3	3	3	3

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

SYLLABUS as per NEP- 2020 B.Sc. VII SEMESTER (HONOURS WITH RESEARCH)		
Course Title: INTRODUCTION TO MEDICINAL AND AROMATIC PLANTS		
Course Code: RTUGTC2	**Credit: 05**	**30+70**
LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Identify medicinal plant and collection of botanical information.
2. Understand cultivation technique of medicinal plants.
3. Understand various processing of crude drugs.
4. Create documentation of medicinal knowledge and conservation.
5. Create knowledge-based employability opportunities in trading of medicinal plants.

Course:

Introduction to different parts of medicinal plants: Stem, Root, Leaf, Flowers, Fruits, Seeds, Woods. Eargastic substance of plants, organized and unorganized drugs- Gums, Resins, Lattices. Sustainable conservation and development strategies of medicinal plant.

Cultivation Techniques of medicinal plants: Eco friendly farming, Organic farming, Nature farming, Ecological farming systems, Integrated intensive farming system, LEISA, Biodynamic agriculture.

Disease of medicinal plants: plant diseases, plant and pathogen relationship, disease development stages, nature and classification of plant diseases, Diseases of medicinal plant –*Withania* and *Rauvolfia*.

Collection and processing of crude drugs: Harvesting, Drying, Decoction, Garbling, Packing, Storage, Active constituents, Standardization of medicinal plants.

Assessment of herbal Medicine: Traditional medicine programme, Importance of plant derived drugs, WHO guidelines for assessment of herbal drugs, objective for improvement, and its strategy.

Suggested Readings:

Pharmacognosy – C.K. Kokate, A.P. Purohit and S.S. Gokhale
Medicinal Plant Cultivation- Purohit and Vyas
Agrotechniques of Medicinal Plants- Ravindra Sharma

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

Course Title: LAB- INTRODUCTION TO MEDICINAL AND AROMATIC PLANTS		
Course Code: RTUGLC2	**Credit:02**	**Marks:30+70**

Course outcomes

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

1. Acquire knowledge to identify selected medicinal plants.
2. Understand about medicinal plants and their derivatives used in herbal, food and cosmetic products.
3. Learn the skill of recognition, collection and preservation of medicinal plants.
4. Prepare herbaria of locally available plants.
5. Create knowledge-based employability opportunities in trading of medicinal plants.

Course:

1. Morphological study of available local medicinal plant.
2. Anatomical study of available local medicinal plants.
3. Processing practices of collected medicinal plant products.
4. Study of plant diseases of medicinal plants.
5. Preparation of herbaria of locally available plants.

Suggested Readings:

Pharmacognosy – C.K. Kokate, A.P. Purohit and S.S. Gokhale
Medicinal Plant Cultivation- Purohit and Vyas
Agrotechniques of Medicinal Plants- Ravindra Sharma

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

SYLLABUS as per NEP 2020 B.Sc. VII SEMESTER (HONOURS WITH RESEARCH)		
Course Title: FOOD PRESERVATION TECHNOLOGY		
Course Code: RTUGTC3	**Credit: 05**	**30+70**
MAJOR/ LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Understand the importance microorganisms in food preservation
2. Learn food preservation based on temperature control.
3. Understand food preservation based on moisture control.
4. Understand irradiation- based food preservation and food additives.
5. Create employability opportunities in food preservation.

Course:

Food Microbiology: Microorganisms associated with foods- bacteria, yeast and mold, importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, Ph, water activity, nutrient and oxygen requirement. Classification of food based on pH, food infection, food intoxication, definition of shelf life, perishable food, semi perishable foods, shelf stable foods. Principles of Food Preservation.

Food preservation by manipulating temperature: *Preservation with low temperature: Freezing and Refrigeration:* Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e., slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food. *Preservation with high temperature:* Thermal Processing: Commercial heat preservation methods- Sterilization, commercial sterilization, pasteurization, and blanching.

Food Preservation by Moisture Control: *Drying and Dehydration:* Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e., mechanical drying), factor affecting rate of drying, names of types of driers used in food industry. *Evaporation:* Definition, factors affecting evaporation, names of evaporators used in food industry.

Food Preservation by Irradiation: Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.

Foods additives and Contaminants: Foods Additives: Need of food additives in food processing and preservation, Characteristics and classification of food additives, Chemical, technological and toxicological aspects. Food Contaminants: Physical and Chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, radionucleides, solvent residues, chemicals, natural toxins).

Continue…

Suggested Readings:

B. Srilakshmi, Food Science, New Age Publishers, 2002
Bawa. A.S, O.P Chauhan *et al*. Food Science. New India Publishing agency, 2013
Deman JM, 2007, Principles of Food Chemistry, 3rd ed. Springer
Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
Meyer, Food Chemistry, New Age, 2004
Potter NH, 1998, Food Science, CBS Publication, New Delhi

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

Course Title: LAB-FOOD PRESERVATION TECHNIQUES		
Course Code RTUGLC3	**Credit-2**	**Marks 30+70**

Course Outcomes

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

1. Apply the principles and methods involved in the processing of different foods.
2. Learn different method of food preservation.
3. Be aware about shelf life of different foods.
4. Be skillful to perform preservation processes.
5. Create employability opportunities in food preservation.

Course:

1. Methods of Sampling
2. Concept of shelf life of different foods.
3. To study the concept of Asepsis and sterilization.
4. Determination of pH of different foods using pH meter.
5. Study of quality characteristics of foods preserved by drying/ dehydration/ freezing.
6. To perform pasteurization of fluids using different methods.
7. To perform blanching of different plant foods.

Suggested Readings:

B. Srilakshmi, Food Science, New Age Publishers, 2002
Bawa. A.S, O.P Chauhan *et al*. Food Science. New India Publishing agency, 2013
Deman JM, 2007, Principles of Food Chemistry, 3rd ed. Springer
Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
Meyer, Food Chemistry, New Age, 2004
Potter NH, 1998, Food Science, CBS Publication, New Delhi

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

SYLLABUS as per NEP 2020 B.Sc. VII SEMESTER (HONOURS WITH RESEARCH)		
Course Title: FOOD PRESERVATION TECHNOLOGY		
Course Code: RTUGTG1	**Credit: 04**	**30+70**
MINOR/ LEVEL-5	**L3+P1**	**Marks:100**

Course Outcomes

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

1. Understand the importance microorganisms in food preservation
2. Learn food preservation based on temperature control.
3. Understand food preservation based on moisture control.
4. Understand irradiation- based food preservation and food additives.
5. Create employability opportunities in food preservation.

Course:

Food Microbiology: Microorganisms associated with foods- bacteria, yeast and mold, importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, Ph, water activity, nutrient and oxygen requirement. Classification of food based on pH, food infection, food intoxication, definition of shelf life, perishable food, semi perishable foods, shelf stable foods. Principles of Food Preservation.

Food preservation by manipulating temperature: *Preservation with low temperature: Freezing and Refrigeration:* Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e., slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food. *Preservation with high temperature:* Thermal Processing: Commercial heat preservation methods- Sterilization, commercial sterilization, pasteurization, and blanching.

Food Preservation by Moisture Control: *Drying and Dehydration:* Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e., mechanical drying), factor affecting rate of drying, names of types of driers used in food industry. *Evaporation:* Definition, factors affecting evaporation, names of evaporators used in food industry.

Food Preservation by Irradiation: Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.

Foods additives and Contaminants: Foods Additives: Need of food additives in food processing and preservation, Characteristics and classification of food additives, Chemical, technological and toxicological aspects. Food Contaminants: Physical and Chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, radionucleides, solvent residues, chemicals, natural toxins).

Continue…

Suggested Readings:

B. Srilakshmi, Food Science, New Age Publishers, 2002
Bawa. A.S, O.P Chauhan *et al*. Food Science. New India Publishing agency, 2013
Deman JM, 2007, Principles of Food Chemistry, 3rd ed. Springer
Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
Meyer, Food Chemistry, New Age, 2004
Potter NH, 1998, Food Science, CBS Publication, New Delhi

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

Course Title: LAB-FOOD PRESERVATION TECHNIQUES		
Course Code RTUGLG1	**Credit-1**	**Marks 30+70**

Course Outcomes

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

1. Apply the principles and methods involved in the processing of different foods.
2. Learn different method of food preservation.
3. Be aware about shelf life of different foods.
4. Be skillful to perform preservation processes.
5. Create employability opportunities in food preservation.

Course:

1. Methods of Sampling
2. Concept of shelf life of different foods.
3. To study the concept of Asepsis and sterilization.
4. Determination of pH of different foods using pH meter.
5. Study of quality characteristics of foods preserved by drying/ dehydration/ freezing.
6. To perform pasteurization of fluids using different methods.
7. To perform blanching of different plant foods.

Suggested Readings:

B. Srilakshmi, Food Science, New Age Publishers, 2002
Bawa. A.S, O.P Chauhan *et al*. Food Science. New India Publishing agency, 2013
Deman JM, 2007, Principles of Food Chemistry, 3rd ed. Springer
Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
Meyer, Food Chemistry, New Age, 2004
Potter NH, 1998, Food Science, CBS Publication, New Delhi

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

SYLLABUS as per NEP- 2020 B.Sc. VIII SEMESTER (HONOURS WITH RESEARCH)		
Course Title: RESEARCH METHODOLOGY AND ETHICS		
Course Code: RTUHTC1	**Credit: 05**	**30+70**
MAJOR LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Understand the nature, types and importance of research methodology and ethics.
2. Apply research methodology procedures according to their nature of research.
3. Be efficient in academic and research writing.
4. Be aware about research and publication ethics.
5. Be well versed in finding employment opportunities in research institutions/projects and publication houses.

Course:

Introduction: Meaning of research, Objectives of research (SMART), Motivation in research, Types of research, Significance of research, Research methods versus methodology, Importance of know how to do research, Various stages of research, Criteria of good research, Problems encountered by researchers in India, Attributes of a research scholar.

Research Problem and Hypothesis: What is a research problem? Selecting the problem, Necessity of defining the problem, Technique involved in defining a problem. Meaning and role of hypothesis in research, types of hypotheses, formulation of hypothesis, verification of hypothesis.

Research Design and Methods of Data Collection: Meaning of research design, need for research design, Features of a good design, Important concepts relating to research design, Different research designs. Methods of data collection: Collection of primary data, Observation method, Interview Method, Collection of data through Questionnaires and Schedules, Difference between Questionnaires and Schedules, Other methods of data collection, Collection of secondary data.

Academic and Research Writing: Importance of academic writing, Various types of research communications, Research reports, Literature of review, Research paper writing (IMRaD style), Referencing and citation, Different styles and compilation of bibliography and their tools, Journal finder/ suggestion tools, preparation and importance of research proposal, Paper presentations, Journal matrix, Author matrix, Indexing services, Citation database- Web of Science, Scopus etc.

Research and publication Ethics. Philosophy and ethics, Scientific misconduct (Falsification, Fabrication and Plagiarism), Types of plagiarism, Tools for detection of plagiarism, Avoiding plagiarism, Publication misconduct, Predatory publishers and journals, SHERPA/RoMEO online resources to check publishers' copyright and self-archiving policies.

Continue…

Suggested Readings:

Research Methodology (Methods and Techniques): 2nd revised edition, C.R. Kothari. New Age International Publishers, New Delhi

Academic Writing: Semalty A. BS Publications, Hyderabad.

Research Methodology: Cauvery R, Sudha Nayak UK, Girija M, Meenakshi R. S Chand Publications New Delhi.

The Academic Writer's Tool Kit: A Users's Manual: Arthur Asa Berger. PHI Learning Pvt. Ltd., New Delhi.

Academic integrity and research quality: University Grants Commission, New Delhi

Good Academic Research Practices: University Grants Commission, New Delhi

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

Course Title: LAB-RESEARCH METHODOLOGY AND ETHICS		
Course Code: RTUHLC1	**Credit: 02**	**30+70**

Course Outcomes

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

1. Use various methods, tools, software needed for good academic/ scientific writing.
2. Use SHERPA/RoMEO online resources to check publishers' copyright and self-archiving policies.
3. Use of different plagiarism software, indexing database/ citation database (WOS/ Scopus)
4. Understand impact factors as per JCR, Cite index, Metrices: h-index, g-index, i10-index, altmatrix.
5. Have practical knowledge related to publications that will help in finding employment in research institutions/projects/ publication houses and as freelance writer.

Course:

1. Practices of preparing short articles/ abstracts/ review articles.
2. Use of English grammar for academic writings.
3. Use of SHERPA/RoMEO online resources to check publishers' copyright and self-archiving policies.
4. Use of software tool to identify Predatory publishers and journals.
5. Use of journal finder/ journal suggester tool viz. JANE, Elsevier journal finder/ Springer Journal suggester.
6. Use of different plagiarism software.
7. Use of indexing database/ citation database (WOS/ Scopus)
8. Impact factors as per JCR, Cite index, Metrics: h-index, g-index, i10- index, altmatrix.

Suggested Readings:

Research Methodology (Methods and Techniques): 2nd revised edition, C.R. Kothari. New Age International Publishers, New Delhi

Academic Writing: Semalty A. BS Publications, Hyderabad.

Research Methodology: Cauvery R, Sudha Nayak UK, Girija M, Meenakshi R. S Chand Publications New Delhi.

The Academic Writer's Tool Kit: A Users's Manual: Arthur Asa Berger. PHI Learning Pvt. Ltd., New Delhi.

Academic integrity and research quality: University Grants Commission, New Delhi

Good Academic Research Practices: University Grants Commission, New Delhi

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

SYLLABUS as per NEP 2020 B.Sc. VIII SEMESTER (HONOURS WITH RESEARCH)		
Course Title: HERBAL DRUG FORMULATION		
Course Code: RTUHTG1	**Credit: 04**	**30+70**
MINOR LEVEL-5	**L3+P1**	**Marks:100**

Course Outcomes

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

1. Understand the constitution of drug and drug delivery system.
2. Understand principles and methods of extraction.
3. Learn aromatic plants for medicinal use.
4. Understand analytical aspects of medicinal plants and drug formulation.
5. Create knowledge-based employment opportunities in analytical pharmacognosy and trading of medicinal plants.

Course:

Introduction: Dosage forms, Desirable properties, classification and application of dosage forms, New drug delivery system.

Principles and methods of extraction: Theory of drug extraction, Hydro-distillation, expression, quality assurance of essential oils maceration, digestion, percolation, soxhelation, super critical fluid extraction, other extraction methods.

Aromatic Plants: History, Revenue potential, industrial significance, medicinal uses; cultivation and management of aromatic plants – Camphor, Citronella, Eucalyptus, Lavender, Lemongrass, Mints, Palmarosa, Sandalwood.

Analytical pharmacognocy: Drug adulteration, Drug evaluation- morphological, microscopic, chemical. Phytochemical investigation, physical, biological evaluation, hepatoprotective activity, hypoglycemic activity, antifertility testing.

Drug formulation: Pharmacopoeial preparations, principles and methods of preparation of aromatic waters, spirits, elixirs, syrups, tincture solution and special preparation of mouthwashes.

Suggested Readings

Medicinal plants of India Vol 1 & 2 ICAR by Kirtikar & Basu.
Indigenous medicinal specialties: U.S. Narayan Rao
Useful plant of Neotropical origin: Heing Brucher
Cultivation and utilization of Aromatic plants: C.K. Atal and B.M. Kapoor
Pharmacognocy - Trease & Evans.
Pharmacognocy- Gokhale, Kokate & Purohit
Professional Pharmacy - Jain & Sharma.
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph
Medicinal Plants- A. Kurian and M.A. Sankar
Medicinal Plants Ethnobotanical Approach- P.C. Trivedi
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph

Continue…

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

Course Code: RTUHLG1	**Credit-1**	**Marks: 30+70**
Course Title: LAB-HERBAL DRUG FORMULATION		

Course Outcomes

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

1. Perform various types of extraction, preparation and evaluation of drug formulations.
2. Carry out evaluation of marketed *Ayurvedic* and herbal formulations.
3. Conduct *in vitro* assays for correlation with biological efficacy of drugs.
4. Conduct antimicrobial activities of herbal drugs.
5. Generate employment opportunities in drug formulation and trading of medicinal plants.

Course:

1. Study of traditional plant and their parts used as folklore medicine.
2. Extraction and distillation of Eucalyptus, Lemongrass, Mints, Sandalwood.
3. Extraction of volatile oil, Extraction of tannin.
4. Formation of Aromatic water, spirits, tinctures.
5. Extraction of Alkaloids, Chemical test for tannin, alkaloid, maceration, percolation.
6. Extraction of medicinal plants by Soxhlet method, Distillation method.
7. Drug formulation- Antimicrobial activity of medicinal plant.

Suggested Readings

Medicinal plants of India Vol 1 & 2 ICAR by Kirtikar & Basu.
Indigenous medicinal specialties: U.S. Narayan Rao
Useful plant of Neotropical origin: Heing Brucher
Cultivation and utilization of Aromatic plants: C.K. Atal and B.M. Kapoor
Pharmacognocy - Trease & Evans.
Pharmacognocy- Gokhale, kokate & Purohit
Cultivation and Utilization of Aromatic plants - L.K. Atal& B.M. Kapoor.
Professional Pharmacy - Jain & Sharma.
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph
Medicinal Plants- A.Kurian and M.A. Sankar
Medicinal Plants ethnobotanical Approach- P.C. Trivedi
Aromatic Plants- Baby S. Skaria, P.P. Joy, G. Mathew, A. Joseph and R. Joseph

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	2	1	3	3	1	3	2	3	1
CO2	3	3	2	1	3	3	1	3	2	3	1
CO3	3	3	2	1	3	3	1	3	2	3	1
CO4	3	3	2	1	3	3	1	3	2	3	1
CO5	3	3	2	1	3	3	1	3	2	3	1

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

Course Code: RTUHDC1	COURSE TITLE Research Project/Dissertation	Credit: 12

Dissertation must be compulsory for all students. Students will have liberty to complete their dissertation work either in the Department or any other Department or Institution. If student desires to complete his/her dissertation work outside the Department, he/she will have to bear all expenses related to complete the dissertation work.

Course Outcomes

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

1. Analyze the relationships among animals, plants microbes and use of Engineering and Computer Sciences for socio-economic development in rural areas.
2. Understand the applications of biological and computer sciences in Apiculture, Aquaculture, Agriculture, Medicine, Remote Sensing and GIS, Rural Engineering and Rural Planning.
3. Perform procedures as per laboratory standards in the areas of Organic Farming, Dairy, Mushroom, Poultry, and Herbal Production, Sericulture, Aquaculture, Art and Crafts, Plant Propagation and Nursery Management etc.
4. Complete any scientific work related to societal benefit, knowledge enhancement and any work of societal/ scientific interest.

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	1	2	3	1	3	3	3	3
CO2	3	3	1	1	2	3	1	3	3	3	3
CO3	3	3	1	1	2	3	1	3	3	3	3
CO4	3	3	1	1	2	3	1	3	3	3	3

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

SYLLABUS as per NEP- 2020 B.Sc. VII SEMESTER (HONOURS)		
COURSE TITLE: INTRODUCTION TO REMOTE SENSING AND GIS		
Course Code: RTUGTC1	**Credit: 05**	**30+70**
MAJOR/ LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Obtain knowledge and hands on experience of application of remote sensing.
2. Understand principles behind remote sensing.
3. Aware with applications of remote sensing in rural development.
4. Work with various software of remote sensing and GIS for rural development.
5. Create employability opportunities in remote sensing and GIS applications.

Introduction: Definition of Remote Sensing, Kinds of Remote Sensing, History and development of Remote Sensing in world. Advantages of remote sensing. Real and Ideal Remote Sensing

Energy Sources: Electromagnetic Energy, Electromagnetic Spectrum & Radiation, Scattering, Absorption and Reflectance in Remote Sensing. Spectral reflectance response of different earth surface features, image enhancement.

History of Aerial Remote Sensing: Type of Aerial photograph, Photographic scale, introduction to Photogrammetry, application of photogrammetry in vertical aerial photograph, difference between satellite image and aerial photograph, stereoscope and platform.

Platforms: Kinds of platforms Introduction to Satellite, Polar orbiting, Geosynchronous and GPS Satellites, their functions and importance

Map and Images: Spatial elements in image, classification of maps, Map scale, Spatial referencing system, map projection.

Suggested Readings:

F.F. Sabins: Remote Sensing – Principles & interpretation
Dr. P. Nag, Dr. M. Kudrat: Digital Remote Sensing, Concept Publishing company 1998
P.J. Curran: Principles of Remote Sensing, Longman.
J.A. Richards: Digital Image Processing in Remote Sensing, Springer
F.F. Sabins: Remote Sensing – Principles & interpretation
Lillesand & Keifer: Remote Sensing & Image interpretation

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	3	1	3	3	2	3	3	3	3
CO2	3	3	3	1	3	3	2	3	3	3	3
CO3	3	3	3	1	3	3	2	3	3	3	3
CO4	3	3	3	1	3	3	2	3	3	3	3
CO5	3	3	3	1	3	3	2	3	3	3	3

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

Course Title: LAB- INTRODUCTION TO REMOTE SENSING AND GIS		
Course Code: RTUGLC1	**Credit:02**	**Marks:30+70**

Course Outcomes

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

1. Identify, analyze and solve geospatial problems.
2. Develop solutions to the growing challenges of Remote Sensing and GIS.
3. Interpret the remotely sensed data.
4. Work with different software related to remote sensing and GIS.
5. Create employability opportunities in remote sensing and GIS applications

Course:

1. To study about toposheet and its component.
2. To study about the map and calculation of map scale
3. To study about different software related to remote sensing
4. Geometric correction.
5. Image processing.

Suggested Readings:

F.F. Sabins: Remote Sensing – Principles & interpretation
Dr. P. Nag, Dr. M. Kudrat: Digital Remote Sensing, Concept Publishing company 1998
P.J. Curran: Principles of Remote Sensing, Longman.
J.A. Richards: Digital Image Processing in Remote Sensing, Springer
F.F. Sabins: Remote Sensing – Principles & interpretation
Lilles and & Keifer: Remote Sensing & Image interpretation

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	3	1	3	3	2	3	3	3	3
CO2	3	3	3	1	3	3	2	3	3	3	3
CO3	3	3	3	1	3	3	2	3	3	3	3
CO4	3	3	3	1	3	3	2	3	3	3	3
CO5	3	3	3	1	3	3	2	3	3	3	3

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

SYLLABUS as per NEP 2020 B.Sc. VII SEMESTER (HONOURS)		
Course Title: INTRODUCTION TO MEDICINAL AND AROMATIC PLANTS		
Course Code: RTUGTC2	**Credit: 05**	**30+70**
MAJOR/ LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Identify medicinal plant and collection of botanical information.
2. Understand cultivation technique of medicinal plants.
3. Understand various processing of crude drugs.
4. Create documentation of medicinal knowledge and conservation.
5. Create knowledge-based employability opportunities in trading of medicinal plants.

Course:

Introduction to different parts of medicinal plants: Stem, Root, Leaf, Flowers, Fruits, Seeds, Woods. Eargastic substance of plants, organized and unorganized drugs- Gums, Resins, Lattices. Sustainable conservation and development strategies of medicinal plant.

Cultivation Techniques of medicinal plants: Eco friendly farming, Organic farming, Nature farming, Ecological farming systems, Integrated intensive farming system, LEISA, Biodynamic agriculture.

Disease of medicinal plants: plant diseases, plant and pathogen relationship, disease development stages, nature and classification of plant diseases, Diseases of medicinal plant –*Withania* and *Rauvolfia*.

Collection and processing of crude drugs: Harvesting, Drying, Decoction, Garbling, Packing, Storage, Active constituents, Standardization of medicinal plants.

Assessment of herbal Medicine: Traditional medicine programme, Importance of plant derived drugs, WHO guidelines for assessment of herbal drugs, objective for improvement, and its strategy.

Suggested Readings:

Pharmacognosy – C.K. Kokate, A.P. Purohit and S.S. Gokhale
Medicinal Plant Cultivation- Purohit and Vyas
Agrotechniques of Medicinal Plants- Ravindra Sharma

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

Course Title: LAB- INTRODUCTION TO MEDICINAL AND AROMATIC PLANTS		
Course Code: RTUGLC2	**Credit:02**	**Marks: 30+70**

Course outcomes

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

1. Acquire knowledge to identify selected medicinal plants.
2. Understand about medicinal plants and their derivatives used in herbal, food and cosmetic products.
3. Learn the skill of recognition, collection and preservation of medicinal plants.
4. Prepare herbaria of locally available plants.
5. Create knowledge-based employability opportunities in trading of medicinal plants.

Course:

1. Morphological study of available local medicinal plant.
2. Anatomical study of available local medicinal plants.
3. Processing practices of collected medicinal plant products.
4. Study of plant diseases of medicinal plants.
5. Preparation of herbaria of locally available plants.

Suggested Readings:

Pharmacognosy – C.K. Kokate, A.P. Purohit and S.S. Gokhale
Medicinal Plant Cultivation- Purohit and Vyas
Agrotechniques of Medicinal Plants- Ravindra Sharma

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

SYLLABUS as per NEP- 2020 B.Sc. VIII SEMESTER (HONOURS)		
Course Title: CROP PRODUCTION TECHNOLOGY		
Course Code: RTUGTC3	**Credit: 05**	**30+70**
MAJOR/ LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Obtain basic knowledge about agriculture equipment, implements and farm machinery for crop production and their management.
2. Learn about cropping system and cropping pattern,
3. Enhance their knowledge and skills related to package and practices of crop production.
4. Calculate the recommended dose of fertilizers and pesticides.
5. Work as consultant/ advisor for crop production technology.

Course:

Equipment required for cultivation: Plough, Share, Cultivator, Hoe, harrow and tractor, Sowing equipment, Plant protection equipment, Crop harvesting and threshing implement.

Agronomy: Definition of Agronomy, scope and importance of agronomy, classification of crops, concepts and types of cropping systems, intensive cropping, crop rotation, mono-cropping, sole-cropping, alley cropping, contour cropping, jhum and shifting cultivation.

Package of practices of Cereal Crops Production: Paddy, Wheat, Maize, Barley, Sorghum. Pulses crops: Groundnut, Pigeon pea, Green and Black Gram, Chickpea, oil crop- Sunflower, Soybean, Mustard, cash crop- Sugarcane and Cotton.

Water management: Concepts of water use efficiency, irrigation methods and drainage system.

Weeds: Definition, Identification, classification and spread of different weeds, integrated weed management (IWM).

Suggested Readings:

Principle of Agronomy – Om Prakash Ahalawat
Handbook of Agriculture - ICAR publication
Handbook of Agriculture -S.S. Singh

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

Course Title: Lab-CROP PRODUCTION TECHNOLOGY		
Course Code: RTUGLC3	**Credit: 02**	**30+70**

Course Outcomes

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

1. Identify and understand working of various farm equipment.
2. Identify crop varieties and various kind of weeds.
3. Calculate optimum amounts of fertilizers and pesticides for crop production.
4. Prepare reports on farm visits/ excursion tours
5. Work as consultant/ advisor for crop production technology.

Course:

1. Identification of agricultural equipment.
2. Identification of weeds.
3. Identification of important crop varieties.
4. Visit to agricultural farms.
5. Calculation of recommended dosage of fertilizers and pesticides.

Suggested Readings:

Principle of Agronomy – Om Prakash Ahalawat
Handbook of Agriculture - ICAR publication
Handbook of Agriculture -S.S. Singh

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

SYLLABUS as per NEP 2020 B.Sc. VII SEMESTER (HONOURS)		
Course Title: INTRODUCTION TO MEDICINAL AND AROMATIC PLANTS		
Course Code: RTUGTG1	**Credit: 04**	**30+70**
MINOR/ LEVEL-5	**L3+P1**	**Marks:100**

Course Outcomes

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

1. Identify medicinal plant and collection of botanical information.
2. Understand cultivation technique of medicinal plants.
3. Understand various processing of crude drugs.
4. Create documentation of medicinal knowledge and conservation.
5. Create knowledge-based employability opportunities in trading of medicinal plants.

Course:

Introduction to different parts of medicinal plants: Stem, Root, Leaf, Flowers, Fruits, Seeds, Woods. Eargastic substance of plants, organized and unorganized drugs- Gums, Resins, Lattices. Sustainable conservation and development strategies of medicinal plant.

Cultivation Techniques of medicinal plants: Eco friendly farming, Organic farming, Nature farming, Ecological farming systems, Integrated intensive farming system, LEISA, Biodynamic agriculture.

Disease of medicinal plants: plant diseases, plant and pathogen relationship, disease development stages, nature and classification of plant diseases, Diseases of medicinal plant –*Withania* and *Rauvolfia*.

Collection and processing of crude drugs: Harvesting, Drying, Decoction, Garbling, Packing, Storage, Active constituents, Standardization of medicinal plants.

Assessment of herbal Medicine:Traditional medicine programme, Importance of plant derived drugs, WHO guidelines for assessment of herbal drugs, objective for improvement, and its strategy.

Suggested Readings:

Pharmacognosy – C.K. Kokate, A.P. Purohit and S.S. Gokhale
Medicinal Plant Cultivation- Purohit and Vyas
Agrotechniques of Medicinal Plants- Ravindra Sharma

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

Course Title: LAB- INTRODUCTION TO MEDICINAL AND AROMATIC PLANTS		
Course Code: RTUGLG1	**Credit:01**	**Marks: 30+70**

Course Outcomes

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

1. Acquire knowledge to identify selected medicinal plants.
2. Understand about medicinal plants and their derivatives used in herbal, food and cosmetic products.
3. Learn the skill of recognition, collection and preservation of medicinal plants.
4. Prepare herbaria of locally available plants.
5. Create knowledge-based employability opportunities in trading of medicinal plants.

Course:

1. Morphological study of available local medicinal plant.
2. Anatomical study of available local medicinal plants.
3. Processing practices of collected medicinal plant products.
4. Study of plant diseases of medicinal plants.
5. Preparation of herbaria of locally available plants.

Suggested Readings:

Pharmacognosy – C.K. Kokate, A.P. Purohit and S.S. Gokhale
Medicinal Plant Cultivation- Purohit and Vyas
Agrotechniques of Medicinal Plants- Ravindra Sharma

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

SYLLABUS as per NEP- 2020 B.Sc. VIII SEMESTER (HONOURS)		
Course Title: GIS APPLICATION AND SCOPE		
Course Code: RTUHTC1	**Credit: 05**	**30+70**
MAJOR/ LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Understand the basic concept of GPS and GIS.
2. Learn the data base management system and its applications.
3. Use remote sensing and GIS in mapping and monitoring land use and land cover.
4. Learn urban and rural planning using GIS.
5. Work as consultant/ advisor for GIS applications.

Course:

Introduction to GIS: Basics of GIS, Definition, components of GIS, DBMS: data base approach, advantage and disadvantage, data model – classic data model, hierarchical data model, network and relational data models, various interpolation techniques.

Classification: Types of data structure, raster and vector format, image data format – BSQ, BIL, BIP, advantage and disadvantage of various data structure, data input – digitization and scanning method, web GIS, map projection, elements of map, introduction to GPS and DGPS its application.

Application of remote sensing and GIS: Mapping and monitoring of land use land cover, forest resource management, principal and approaches of crop production forecasting, soil classification, surface hydrology analysis.

Urban and rural area planning: Urban and rural area sprawl and change detection studies, population estimation, site suitability analysis for – settlement, transportation irrigation system, storage and other facilities.

Suggested Readings

Remote Sensing – Principles & interpretation - F.F. Sabins
Digital Remote Sensing - Dr. P. Nag, Dr. M. Kudrat
Principles of Remote Sensing - P.J. Curran.

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

Course Code: RTUHLC1	Credit-2	Marks: 30+70
Course Title: LAB-GIS APPLICATION AND SCOPE		

Course Outcomes

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

1. Have practical knowledge on ArcGIS and QGIS.
2. Draw map layout using GIS
3. Create personal and geo-data base.
4. Carry out surface analysis and lay out preparation.
5. Work as consultant/ advisor for GIS applications.

Course:

1. Practice based on ArcGIS and QGIS
2. To generate various Indices map – NDVI, NDWI, NDBI, SAVI
3. Data Collection and Interpolation methods for map layout.
4. Surface analysis.
5. Layout preparation.
6. Creation of personal and geo-data base.

Suggested Readings

Remote Sensing – Principles & interpretation - F.F. Sabins
Digital Remote Sensing - Dr. P. Nag, Dr. M. Kudrat
Principles of Remote Sensing - P.J. Curran.

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

SYLLABUS as per NEP 2020 B.Sc. VIII SEMESTER (HONOURS)		
Course Title: INTRODUCTION TO TRADITIONAL SYSTEMS OF MEDICINE		
Course Code: RTUHTC2	**Credit: 05**	**30+70**
MAJOR/ LEVEL-5	**L3+P2**	**Marks:100**

Course Outcomes

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

1. Understand various traditional medicine systems of *Bharat*.
2. Understand various dosage forms of various *Ayurvedic* drugs
3. Understand naturopathy and aromatherapy.
4. Understand Unani system of medicine.
5. Find employment opportunity in NGOs/ research projects/ trading of medicinal plants.

Course:

Introduction: History, definition and scope of traditional system of medicine, Concept and principles of *Ayurveda*. *Ayurvedic* drugs, Classification, Extraction process in *Ayurveda*. Traditional equipment used in *Ayurveda* for fermentation.

Dosages: Ayurvedic dosage forms, Method of preparation of Asava and aristha, Arka, Avaleha, Kwatha, Churna, Guggul, Ghrita, Taila, Dravaka, Lavana Khara, Lepa, Vati and Gutika, Verti-Netrabindu and Anjana, Sattva, Kupipakva, Rasayna, Parpati, Pisti, Bhasma mandura, Rasayoga, Lauha.

Siddha system of medicine: History, Siddha science and Siddhars, Infrastructure and network in India, Global scenario, Initiative and network of India Government, Strength of Siddha, Basic concept.

Naturopathy and Aromatherapy: Introduction, Nature essential oils, their uses and principles.

Unani system of medicine: Historical evolution, Unani system of medicine in India, Strength and Principles.

Suggested Readings:

1. Siddha system of medicine- the science of holistic health- Ministry of ayurveda, yoga and naturopathy, Unani, Siddha, Homeopathy and Ayush Government of India, 2019.
2. Unani system of medicine- The science of health and healing- Department of Ayush Ministry of Health and family welfare, Government of India New Delhi.
3. Pharmacognosy- C.K Kokate, A.P Poruhit and S.B Gokhale; Nirali Prakashan.
4. A textbook of Professional Pharmacy- N.K Jain & S.N Sharma- M/s Vallabh Prakashan.

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

Course Title: LAB- INTRODUCTION TO TRADITIONAL SYSTEMS OF MEDICINE		
Course Code: RTUHLC2	**Credit:2**	**Marks: 30+70**

Course Outcomes

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

1. Understand various plants used in Bhartiya traditional medicine systems.
2. Understand various methods and equipment used in preparations of *Ayurvedic* drugs.
3. Carryout distillation of herbal drugs.
4. Understand the use of *Ayurvedic* and *Unani* drugs.
5. Find employment opportunity in NGOs/ research projects/ trading of medicinal plants.

Course:

1. Study of plants used in *Ayurveda.*
2. Extraction of herbal drugs through soxhlation.
3. Distillation of herbal drugs.
4. Study of traditional equipment.
5. Study of different Ayurvedic, Unani drugs.

Suggested Readings:

1. Siddha system of medicine- the science of holistic health- Ministry of ayurveda, yoga and naturopathy, Unani, Siddha, Homeopathy and Ayush Government of India, 2019.
2. Unani system of medicine- The science of health and healing- Department of Ayush, Ministry of Health and family welfare, Government of India New Delhi.
3. Pharmacognosy- C.K Kokate, A.P Poruhit and S.B Gokhale; Nirali Prakashan.
4. A textbook of Professional Pharmacy- N.K Jain & S.N Sharma- M/s Vallabh Prakashan.

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

SYLLABUS as per NEP 2020 B.Sc. VIII SEMESTER (HONOURS)		
Course Title: NATURAL PRODUCT AND PROCESSING TECHNIQUES		
Course Code: RTUHTG1	**Credit-4**	**30+70**
MINOR/ Level:4	**Credit-L3+P1**	**Marks: 100**

Course Outcomes

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

1. Understand different types of natural products and their tribal connections.
2. Understand storage, marketing and importance of natural products.
3. Understand processing and importance of fibres and gums.
4. Understand processing and importance of dyes.
5. Find employment opportunity in NGOs/ research projects/ trading of natural products.

Course:

Natural products: Introduction, plants as a source of various products, types of natural products, natural products and tribal connection, dependence of tribes on forest, various method of collection, storage and marketing of natural products, .

Fibre: Introduction, classification of fibres, plant origin fibres, types, study of cotton, flax and jute fibre, various fibre industries and economic importance.

Gum and Resin: Introduction, classification, physical and chemical composition, plant origin gum and resins, collection techniques, processing and economic importance.

Dye: Sources, types of dyes, chemical nature, characteristics of natural dyes, preparation of natural dyes, extraction of dye, processing and uses.

Suggested Readings

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

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	2	1	3	3	1	3	2	3	2
CO2	3	3	2	1	3	3	1	3	2	3	2
CO3	3	3	2	1	3	3	1	3	2	3	2
CO4	3	3	2	1	3	3	1	3	2	3	2
CO5	3	3	2	1	3	3	1	3	2	3	2

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

Course Title: Lab-Natural Product and Processing Techniques		
Course Code: RTUHLG1	**Credit-1**	**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.
2. Understand the need- based development of products.
3. Consider issues around indigenous knowledge, traditional use, cultural perspectives and ownership of native flora and fauna.
4. Gain practical skills in the extraction, purification and analysis of natural products.
5. To be skillful of handling natural products for employment in various sectors.

Course:

1. Identification of fibre producing plants.
2. Study of fibre processing techniques.
3. Identification of gum producing plants & characteristics.
4. Tapping & collection of gums from various plant sources.
5. Study of various types of resin & their sources
6. Identification of dye producing plants.
7. Study on dye preparation techniques.
8. Microscopic study of fibres.
9. Preparation of herbaria.

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

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

SYLLABUS as per NEP- 2020 B.Sc. VIII SEMESTER (HONOURS)		
Course Title: FUNDAMENTALS OF ENTREPRENEURSHIP		
Course Code: RTUHTG2	**Credit-4**	**30+70**
MINOR/ Level:5	**L3+T1**	**Marks: 100**

Course outcomes

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

1. Understand entrepreneurship and qualities of an entrepreneur.
2. Aware about entrepreneurship development in India.
3. Understand MSMEs and startups.
4. Start SSI/ cottage industries along with the various sources of financial support.
5. Generate employability opportunities in various sectors.

Course:

Introduction to Entrepreneurship: Meaning, Definition, Factors stimulating Entrepreneurship, Phases of Entrepreneurship Development, factors affecting Entrepreneurship growth, Entrepreneurial behavior. International Entrepreneurship-meaning, Difference between domestic and International Business.

Entrepreneurship Development in India: History, Entrepreneurship development Programme, Importance of Entrepreneurship Development, Object of EDP, Phases of EDP, Problems.

Women Entrepreneurship: Concept, Factors Influencing of Women Entrepreneurship, Male vs. Women Entrepreneurs, Problems of Women Entrepreneurs, Remedial Measures, Scope and Opportunities for Women Entrepreneurs.

Starting an MSME: Business idea, Preparation of Preliminary Project Report, Detailed Project Report, Location, Apply for Registration, Apply for loan, Apply for subsidy, place order for Machinery, Arrangement of Power, Insurance, Government Clearance, Procurement of Raw Material.

Start Ups: Introduction, Start- up Initiatives by Government, Mentors, Accelerators, Incubators, Sources of Finance for start- ups, Failure, Strategies for Success, Start- Up-Innovation in India. Forms for ownership Sole Proprietorship, partnership, co-operative organization

Reference Books:

M.B. Shukla: Entrepreneurship and Small Business Management, Kitab Mahal
S.S. Kanka: Entrepreneurial Development
Prasanna Chandra: Project Planning, Analysis, Selection, Implementation and Review Tata McGraw Hill.
Vasantha Desai: Dynamics of Entrepreneurial Development
C.B. Gupta & N.P. Sreenivasan: Entrepreneurial Development
Nirmal K. Gupta: Small Industry – Challenges and Perspectives

Continue…

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	1	2	3	1	3	3	3	1
CO2	3	3	1	1	2	3	1	3	3	3	1
CO3	3	3	1	1	2	3	1	3	3	3	1
CO4	3	3	1	1	2	3	1	3	3	3	1
CO5	3	3	1	1	2	3	1	3	3	3	1

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

Course Title: TUTORIAL- FUNDAMENTALS OF ENTREPRENEURSHIP		
Course Code: RTUHLG2	**Credit-1**	**Marks 30+70**

Course outcomes

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

1. Understand practical aspects of entrepreneurship
2. Practice and understand operation of MSME.

Course Outcomes and their mapping with Program Outcomes:

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

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

List of SEC and Vocational courses to be offered by the Department of Rural Technology and Social Development (NEP 2020)

Semester	Name	Code	Name of Paper	Credit
I Semester	SEC	SECRT01	Dairy Management and Products	2 Credit
		SECRT02	Lab- Dairy Management and Products	1 Credit
	MDC	MDCRT01	Indigenous Crafts	2 Credit
		MDCRT02	Laboratory Course of Indigenous Crafts	1 Credit
	VAC2	VACRT01	Historical Perspective of Bhartiya Education	2 Credit
II Semester	SEC	SECRT03	Herbal Production Technology	2 Credit
		SECTRT04	Lab-Herbal Production Technology	1 Credit
	MDC	MDCRT03	Indigenous Arts	2 Credit
		MDCRT04	Laboratory Course of Indigenous Arts	1 Credit
III Semester	SEC	RSECRT05	Basics of Mushroom Cultivation and Production	2 Credit
		SECRT06	Lab- Basics of Mushroom Cultivation and Production	1 Credit
Vocational Courses				