

# **SYLLABUS**

**Based on**

**LEARNING OUTCOMES BASED CURRICULUM  
FRAMEWORK (LOCF)**

**M.Sc. (Rural Technology)**

**2021-2022**



**DEPARTMENT OF RURAL TECHNOLOGY AND SOCIAL  
DEVELOPMENT**

**GURU GHASIDAS VISHWAVIDYALYA**

**(A Central University)**

**Koni, Bilaspur, Chhattisgarh. 495009**

**Department of Rural Technology & Social Development**  
**Guru Ghasidas Vishwavidyalaya, Koni-Bilaspur (CG)**  
**Semester-wise syllabus for PG Course**

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**Syllabus**

**2021-22**

**Master of Science of Rural Technology**

<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. I SEMESTER</b>		
<b>Course Title: CONCEPTS OF STATISTICAL ANALYSIS</b>		
<b>Course Code: RTPATC1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand concepts of statistics and its applications in various fields.
- Analyze the data and interpret it in logical manner.

Introduction, concept, meaning, definition and importance of statistics, concept of variables, data coding and decoding, classification (parametric and non parametric), tabulation, graphical and diagrammatic representation of numerical data.

Measurement of central tendency- mean, mode, median, dispersion- Mean deviation, Standard deviation.

Probability Concept, various definition of probability, Addition theorem of probability, Probability distributions (viz. Binomial, Poisson and normal) and their applications.

Coefficient of Variation, Skewness and Kurtosis, Correlation and Regression Analysis, Analysis of variance (ANOVA).

Sampling Methods- Statistical Test Hypothesis, Barrier test- z, t, F and Chi square distribution.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPALC1</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Coding and decoding of data.
2. Problems based measurement of central tendency.
3. Problems based measurement of dispersion
4. Testing of hypothesis.
5. Analysis of variance (ANOVA).
6. To study the statistical software.
7. Graphical representation of numerical data

**Reference Books**

An Introduction to Statistical Methods - Gupta C.B.  
Quantitative approach to managerial decision- Hien, L.W.  
Statistics for Business & Economics, Lawrence B. Morse.  
Statistics for Management, Levin, Richard I. and David S. Rubin.  
Fundamentals of Statistics- D.N. Elhance, Veena Elhance and B. M. Aggrawal  
Basic concept in statistics, K.S. Kushwaha

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. I SEMESTER</b>		
<b>Course Title: INNOVATION, APPRAISAL AND ACTION FOR RURAL DEVELOPMENT</b>		
<b>Course Code: RTPATC2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Learn about the characteristic of innovation and diffusion process among the social system.
- Conduct PRA, RRA and formulate the social planning.

Innovation- Definition, Characteristic of innovation, importance of innovation in day today life, Technology diffusion –Definition, innovation decision process and factors that affect diffusion process.

Adoption process – concept, stages in adoption process, rate of adoption, adopter categories, adopter’s characteristics, factor that affect adoption process.

Communication– Definition, concepts and various models of communication, types of communication, barriers in communication. Transfer of Technology – Concept of Technology, Appropriate Technology- Definition and characteristics, different Models of technology transfer, barriers in Transfer of Technology.

PRA- Definition, Principles and Approaches of PRA, PRA Tools- Mapping, Types of mapping- social resource/ land use pattern map, enterprise map, transect walk, time line, change and trends, Matrix ranking, Mobility map, Venn diagram. RRA and PLA: Introduction, foundation, process, difference between RRA and PRA, Project appraisal.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPALC2</b>	<b>Credit:02</b>	<b>Marks:100</b>

**Field based exercises:**

1. Exercise based on PRA Approaches
2. To study communication models.
3. To study adoption process.

**Reference Books**

Gandhian Thought – J. B. Kripalani.  
Challenging the Professions - Robert Chambers  
Human Problems in Technological Change – E. E. Russel  
Communication of Technological innovations- O.P. Dhama  
Participatory rural appraisal in agricultural animal husbandory- Shagufta Jamal and H. P. S. Arya  
Participatory rural appraisal and questionnaire survey-Neela Mukharjee  
Participatory rural appraisal methodology and application-Neela Mukharjee  
Participatory learning and action- Neela Mukharjee  
Participatory rural appraisal methods and application in rural planning-Amitava Mukharjee

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. I SEMESTER</b>		
<b>Course Title: SERICULTURE</b>		
<b>Course Code: RTPATG1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand scientific method of silk production technique and management.
- Aware various Government schemes / programs related to sericulture.

General sericulture: Definition, silk types, history and importance of sericulture, Geographical distribution of various species and economic races of silkworms, Government schemes / programs related to sericulture.

Basic biology of silk insect: Silkworm taxonomy based on mulberry and non-mulberry silk worms-Tasar, Eri and Munga, life cycle including moulting and metamorphosis, Diseases of silkworm, Pests of silkworm.

Host plant management: Host plants for sericulture and their propagation, effects of agro-climatic conditions on the growth of host plants with special reference to mulberry, Diseases of mulberry plant, Mulberry pest management.

Silkworm rearing: Mud house rearing, silkworm rearing (C.S.B. proposed model rearing house), Rearing appliances, disinfection, disinfectants, bed cleaning, feeding of worms, Maintaining optimum condition of rearing, brushing, frequency of spacing, care during moulting, Mounting and mountage, process of spinning, cocoon harvesting, Rearing method: chawki rearing or young age worm rearing, Late age silkworm rearing (according to 100 dfl).

Post cocoon technology and silk technology: method of cocoon testing and grading, cocoon stifling, storage of cocoon, deflossing, cocoon riddling, mixing or blending, cocoon cooking, brushing, Concept of difference reeling machines, reeling operation, reeling end formation, testing and grading of raw silk, Degumming, bleaching, dyeing of silk yarn, Twisting, Reeling, Re-reeling, lacing, skeining, weaving of silk.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPALG1</b>	<b>Credit:02</b>	<b>Marks:100</b>

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.
9. Comparative study of good and defective cocoons.

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**Reference Books:**

Sericulture introduction - Ganga, G.

Seri Manual - FAO Manual

Appropriate Sericulture - Jolly, M.S.

Sericulture in India- Vol. I to IV, H.O. Agrawal and M.K. Seth.

An introduction to Sericulture -G.J. Sulochana

Principle of temperate Sericulture - Dr. A.S. Kamal, Kamayani Publisher

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. I SEMESTER</b>		
<b>Course Title: LAC PRODUCTION TECHNIQUE</b>		
<b>Course Code: RTPATG2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand economic importance of lac insect and lac produces.
- Enhance their knowledge and technical skills to produce lac in various host plants.

Lac insect: meaning, concept and economic importance of lac cultivation. Classification and morphology and life cycle of lac insect, types of lac insect, history of lac cultivation, area and geographical distribution of lac insect, natural habitat of lac insect, types of lac and its characteristics.

Lac production in *Butea monosperma*: Introduction, history, natural habitat, merits and limitations, lac insect and crop, stages of rangeeni lac insect, selection of trees, pruning of trees, inoculation of host tree, removal of used-up broodlac, pest management, crop harvesting, scraping of lac from sticks, primary processing of lac, storage, transport and marketing of lac.

Lac production in *Ziziphus mauritiana*: Introduction, history, natural habitat, merits and limitations, lac insect and crop, stages of rangeeni and kusmi lac insect, selection of trees, pruning of trees, inoculation of host tree, removal of used-up broodlac, pest management, crop harvesting, scraping of lac from sticks, primary processing of lac, storage, transport and marketing of lac.

Lac production in *Schleichera oleosa*: Introduction, history, natural habitat, merits and limitations, lac insect and crop, stages of kusmi lac insect, selection of trees, pruning of trees, inoculation of host tree, removal of used-up broodlac, pest management winter and summer crops, crop harvesting, scraping of lac from sticks, primary processing of lac, storage, transport and marketing of lac.

Lac production in *Flemingia semialata*: Introduction, history, natural habitat, merits and limitations, lac insect and crop, stages of kusmi lac insect, propagation and nursery management, planting and nutrient management, pruning of trees, inoculation of host tree, removal of used-up broodlac, pest management winter and summer crops, crop harvesting, scraping of lac from sticks, primary processing of lac, storage, transport and marketing of lac.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPALG2</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Identification and preparation of different host plants for lac cultivation.
2. Selection and inoculation of broodlac in host plant.
3. Removal of used-up broodlac sticks from host plants.
4. Processing of lac.
5. Lac crop protection.
6. Study of equipments used in lac cultivation.
7. Identification of lac insect and lac crops.

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**Reference Books:**

Chapman: The Insects: structure and function 94<sup>th</sup> 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  
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.

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. I SEMESTER</b>		
<b>Course Title: NATURAL PRODUCT AND PROCESSING TECHNIQUES</b>		
<b>Course Code: RTPATO1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand different types of natural products and its importance.
- Learn processing of important natural products.

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.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPALO1</b>	<b>Credit:02</b>	<b>Marks:100</b>

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.

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. I SEMESTER</b>		
<b>Course Title: FOOD PRESERVATION TECHNIQUES</b>		
<b>Course Code: RTPATO2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

### Learning outcomes

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

- Understand the importance microorganisms in food preservation
- Learn various food processing and preservation technologies.

**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 requirements. Classification of food based on pH, Food infection, food intoxication, definition of shelf life, perishable foods, 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), factors 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.

**Food additives and Contaminants:** *Food 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, radionuclides, solvent residues, chemicals, natural toxins).

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPALO2</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Methods of Sampling.
2. Concept of shelf life of different foods

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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.

**Reference Books:**

- B. Srilakshmi, Food Science, New Age Publishers, 2002
- Bawa. A.S, O.P Chauhan et al. Food Science. New India Publishing agency, 2013
- Demman 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

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. II SEMESTER</b>		
<b>Course Title: FUNDAMENTALS OF MEDICINAL PLANTS</b>		
<b>Course Code: RTPBTC1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand medicinal important of secondary metabolites of plants.
- Learn the Government policies and marketing potential of crude drugs.

Methods of plant classification, Taxonomic keys, Herbarium, Taxonomic study of important plant families of Chhattisgarh with special reference to family Asclepiadaceae, Apiaceae, Chenopodiaceae, Euphorbiaceae, Combretaceae, Liliaceae.

Medicinal plant found in Chhattisgarh: General aspects and Medicinal values of– *Aegle marmelo*, *Cinnamomum* spp., *Gloriosa superba*, *Ipomoea nil*, *Mucuna pruriens*, *Piper nigrum*, *Vitex nigundo*.

Alkaloids: Properties, isolation and extraction, classification and alkaloid containing drug;  
 Terpenes and Terpenoids: Properties, Isolation, classification and drugs containing terpenes and terpenoids.

Tannins: Properties, isolation and extraction, classification and tannin containing drugs.  
 Marine drug: Properties, classification uses; Mineral drug: Sources, constituents and uses.

Legislation and policy of medicinal plants: National and State Medicinal Plant Board, Conservation of medicinal plants, Market potential of crude drugs, Goals of national policy, Future action plans.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPBLC1</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Study of locally available plants of families Asclepiadaceae, Apiaceae, Chenopodiaceae, Euphorbiaceae, Combretaceae, Liliaceae.
2. To study extraction process, chemical test to identify Alkaloids
3. To study extraction process, chemical test to identify Terpenes and Terpenoids.
4. To study extraction process, chemical test to identify Tannins.
5. To study source of mineral drugs and their uses.

**Reference Books**

Medicinal plants of India Vol 1 & 2 ICAR – Kirtikar & Basu.  
 Compendium of Indian Medicinal plants Vol 1-4 – R. P. Rastogi & B.N. Mahrotra.  
 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.  
 Cultivation and utilization of medicinal plants - C.K. Atal and B.M. Kapoor.  
 Plant Taxonomy- O.P. Sharma  
 Essential of Plant Taxonomy and Ecology-M.P. Singh and S.G. Abbas

<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. II SEMESTER</b>		
<b>Course Title: CONCEPTS OF REMOTE SENSING AND GIS-I</b>		
<b>Course Code: RTPBTC2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand the concept and application of remote sensing and GIS software.
- Learn the basic of satellite images and toposheets.

Concepts of Remote Sensing with introduction, Early History, Energy Sources & Radiation Principles, Energy Interactions in atmosphere, Energy interactions with earth surface features, Spectral Reflectance of vegetation, Soil & water.

Satellite: Indian satellite, Earth Resource satellite, Ocean satellite, Resource-sat satellite, Carto-sat satellite etc. and their uses.

Photogrammetry-Introduction, Types of Aerial Photographs including UAV, Basic principles of Photogrammetry, Geometry of a vertical aerial photograph, photographic Scale, Applications of vertical aerial photograph. Thematic Cartography: Commitments, concern and solution. Influence of thematic Atlases, Influences of distant cartography, and Innovative trends in mapping.

Digital Image Processing (DIP)-Introduction, Pre-processing of image-Image interpretation, Geometric & Radiometric Correction, Resolution, Image Enhancement, Contrast Stretching, Filters, Edge Enhancement.

Microwave Remote Sensing-Introduction, sensors, instruments, radar operating principles, synthetic aperture RADAR, radar returns and image signatures, radar image characteristics, basics of LIDAR.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPBLC2</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Geometric and radiometric correction of satellite data, Image enhancement techniques, Principal component analysis,
2. Supervised classification, Supervised classification schemes (Maximum likelihood, nearest neighbor and artificial neural network classification), Vegetation indices.
3. Creation of digital elevation model through contour digitization and surface hydrology.
4. Digitization of different features of given topo-sheet. Editing attributes of geo-database features. Creating different features like polygon line, tic, polyline etc.
5. Creation of personal geo-database.

**Reference Books**

Remote Sensing – Principles & interpretation - F.F. Sabins  
 Digital Remote Sensing - Dr. P. Nag, Dr. M. Kudrat  
 Principles of Remote Sensing - P.J. Curran.  
 Basics of Remote Sensing – S. Joseph  
 Basics of remote sensing and photogrammetry – Lillisan

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. II SEMESTER</b>		
<b>Course Title: RESEARCH METHODOLOGY AND ETHICS</b>		
<b>Course Code: RTPBTA1</b>	<b>Credit: 02</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand the nature, types and importance of research methodology and ethics.
- Apply research methodology procedures according to their nature of research.

Research, types of research, Nature, scope of research and importance of research methodology, steps of scientific inquiry and study of social phenomenon, research problems, criteria for identification of research problems, formulations and statement of research objectives.

Hypothesis- Meaning and role in research, type of hypothesis, testing of hypothesis, method of data collection, level of measurement, data sources; observational and survey methods, case studies, types of schedule, questionnaires.

Research design- Exploratory, descriptive, and experimental research design, qualitative and quantitative research. Complete Randomized Block Design (CRD), Randomized Block Design (RBD), Latin Squares Design (LSD) and factorial design.

Research reporting and scientific writing- Preparation of research proposal, compilation of thesis, dissertation, compiling bibliography, reports, compilation of research paper, paper presentation, research ethics.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPBLA1</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. To study the identification of research problems.
2. To study the objective formation process.
3. Formulation and testing of hypothesis.
4. To study the review and references writing styles.
5. To study the dissertation/thesis writing style/research paper/manual.
6. Research paper presentation skills.

**Reference Books**

Survey Method

Exploring research

Guide to the successful thesis and dissertation V<sup>th</sup> Edition

Fundamentals of Statistics

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. II SEMESTER</b>		
<b>Course Title: RURAL WASTE MANAGEMENT</b>		
<b>Course Code: RTPBTG1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Aware about sanitation and waste water management.
- Adopt different methods of waste management.

Introduction of Rural waste, Type of waste, different methods of systematic collection and disposal of waste, Types of sewer.

Concept of sewage treatment, principle of primary, secondary treatment and Tertiary treatment of wastewater, General composition of sewage, method of determination of B.O.D. and C.O.D.

Rural Sanitation- Provision of safe and potable water for domestic purposes, collection and disposal of dry refuse, collection and disposal of sullage, disposal of excretal waste, night soil disposal without water carriage, Construction of low cost latrines in rural areas- Septic tanks, soak pit, privy pit and bore hole privy, can privy, concrete vault privy, aqua privy, PRAI latrine.

Waste water management- performance criteria for waste water management system, house drainage plan, classification of traps- P-trap, Q-trap, S trap, floor trap, gully trap, intercepting trap, grease trap, principle for efficient drainage system.

Solid waste management- classification of solid waste, quantity and composition of refuse, collection and removal of refuse, transport of refuse, disposal of refuse- controlled tipping, landfill, trenching, dumping into sea, pulverization, incineration; composting- composting by trenching, open window composting, mechanical composting, composting adopted in India, Biogas technology-properties of biogas, types of biogas plant recognized by MNES (Ministry of Non-conventional Energy Sources).

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPBPG1</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. To study types of waste material.
2. To study the physical treatment of waste water.
3. To study the biological treatment of waste water.
4. To study the chemical treatment of waste water.
5. Visit to sewage treatment plants.
6. To study biogas technology of solid waste management.
7. To study landfill method of solid waste management.
8. To study various model of privy.
9. To study biogas technology as solid waste management.

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**Reference Books**

Rangwala S.C, Water Supply & Sanitary Engineering, Charotar Publishing House (P) Ltd., Anand.

Gurcharan Singh, Water Supply & Sanitary Engineering, Standard Publishers Distributors, Delhi.

Garg, S.K., Water Supply Engineering, Khanna Publishers, Delhi.

Gupta, D.V. Water Supply & Sanitary Engineering, Asian Publishers, Muzaffarnagar

Modi, P.N. Water Supply Engineering, Standard Book House, Delhi

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. II SEMESTER</b>		
<b>Course Title: SOIL AND WATER CONSERVATION ENGINEERING</b>		
<b>Course Code: RTPBTG2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand the soil formation, soil profile, soil structure and different type of soil nutrients.
- Understand the basic concept of soil water conservation and watershed management.

Soil- Definition, Soil as a three phase system, Soil-Plant-Water relationship, soil moisture content, soil profile, density, void ratio, porosity, soil texture, soil structure and degree of saturation.

Basic concept of soil erosion, control of soil erosion, soil loss estimation, concept of runoff and its estimation, water budgeting, estimation of rainfall erosivity and erodibility.

Planning, design, construction and maintenance of water harvesting structure, soil and water conservation structure, GIS application in Planning, designing, construction and maintenance of water harvesting structure.

Watershed management concept- objectives, characterization, type of watershed, planning, execution, integrated community participation and evaluation, GIS application in watershed management.

Irrigation- Definition, Types of irrigation, Source of irrigation water. Irrigation methods and efficiencies, Drainage - Definition, surface and sub-surface drainage, factors influencing drainage.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPBLG2</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Study of different water harvesting structure.
2. Study of GIS Application in watershed management
3. Study of different components of sprinkler and drip irrigation system
4. Study of continuous and staggered contour trenches
5. Study of different components of farm pond
6. Water budgeting.

**Reference Books**

Introduction to soil and water conservation engineering, Mal, B C, Kalyani publishers  
 Irrigation Engineering-Agarwal G.D., B. Bharti Prakashan, Merrut.  
 Irrigation Engineering, -Modi P.N., Standard Book House, Delhi.  
 Irrigation Engineering- Dr. Bharat Singh, Nem Chand & Bros., Roorkee  
 Introductory Soil Science, Dilip Kumar Das, Kalyani Publishers.  
 Soil and water conservation engineering, R. Suresh  
 Irrigation: Theory and practices, A.M. Michael



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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. III SEMESTER</b>		
<b>Course Title: DRUG FORMULATION AND EXTRACTION</b>		
<b>Course Code: RTPCTC1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

### Learning outcomes

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

- Understand the constitution of drug and drug delivery system.
- Learn drug formulation and extraction phenomenon.

Introduction to 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, soxhlet, 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 pharmacognocny- 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.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPCLC1</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Study of traditional plant and their part 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.

### 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

Pharmacognocny - Trease & Evans.

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Pharmacognocny- 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  
Compendium of Indian Medicinal plants Vol 1-4 R.P. Rastogi& B.N. Mahrotra.

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. III SEMESTER</b>		
<b>Course Title: GEOSPATIAL TECHNOLOGY AND ITS APPLICATION</b>		
<b>Course Code: RTPCTC2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand the basic concept of GPS and GIS.
- Learn the data base management system and application.

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.

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.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPCLC2</b>	<b>Credit:02</b>	<b>Marks:100</b>

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.

**Reference Books**

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

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. III SEMESTER</b>		
<b>Course Title: MUSHROOM CULTIVATION TECHNOLOGY</b>		
<b>Course Code: RTPCTG1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand the importance of Single Cell Protein.
- Learn the commercial production of mushroom and its marketing potential.

Introduction, General characteristics of Mushroom, history of mushroom cultivation; biology of mushrooms; Identification of mushroom, Nutritional and Medicinal value of mushrooms; Poisonous mushrooms and its poisoning; edible mushrooms and its cultivation in India and world.

Cultivation technology, infrastructure, equipments and substrates in mushroom cultivation, mushroom unit or mushroom house, pure culture, Spawn, preparation of spawn, raw materials for the cultivation of mushroom, Compost: materials used for compost preparation, compost technology in mushroom production; Casing; raw material used for casing, preparation of casing material.

Cultivation of important mushrooms: General process for the cultivation of *Agaricus bisporus*, *Pleurotus ostreatus*, *Calocybe indica*, *Volvariella volvaceae* and *Ganoderma lucidum*, Pests and Pathogens of mushrooms and their management.

Storage and food preparation from mushrooms: Methods of storage of mushroom, Long term and short term storage of mushrooms, Foods/recipes from mushrooms; Mushroom research centers/farms: National level and regional level, Marketing of mushrooms in India and world.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPCLG1</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Morphology and identification of local mushroom and preserved specimen of mushroom.
2. Sterilization of glassware, equipments, and culture media used in mushroom cultivation.
3. Preparation of culture media and mother culture.
4. Preparation of spawn: Grain spawn, Straw spawn, Sawdust spawn.
5. Preparation of compost and known compost formulations.
6. Cultivation procedure for *Agaricus bisporus*.
7. Cultivation procedure for *Pleurotus ostreatus*.
8. Criss-cross bed and out-door method for cultivation of *Volvariella volvaceae*.
9. Cultivation procedure for *Ganoderma lucidum*.
10. Cultivation procedure for *Calocybe indica*.
11. Storage and preservation of mushroom.

**Reference Books:**

The Mushroom Identifier- David Pegler & B. Sproner.  
Mushroom Cultivation- B.Tripathi & H.P.Shukla  
Mushroom Growing- S.C.Day  
A handbook of Mushroom- Neeta Bhale

<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. III SEMESTER</b>		
<b>Course Title: BEEKEEPING TECHNIQUES</b>		
<b>Course Code: RTPCTG2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

### Learning outcomes

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

- Understand economic importance and ecological benefits of beekeeping.
- Enhance their knowledge and technical skills on beekeeping.

**Introduction:** Beekeeping in India, benefits of beekeeping, honey bee products and marketing potential, honey bee species and its importance, bee biology, castes of bees, stages of development in honey bees, sex differential in honey bees, bee food plants, communication among bees.

**Beekeeping equipments:** Different types of hives, specifications of beehives-Langstroth ten-frame hive; Newton's bee hive; advantages of rearing bees in modern beehives, other beekeeping equipments- hive stand, smoker, protective equipments, comb foundation sheet, dummy division board/movable wall, porter bee escape board, drone excluder or drone trap, swarm trap, pollen trap, division board / sugar feeder and various hive tools.

**Site selection and management:** Selection of site, starting a colony, establishment of a beehive-capturing a swarm of bees, purchase a packaged bee colony, using nucleus; division of colony, inspecting the bee colony, safety measures; apiary management- colony inspection, cleaning in beehive, feeding bees with sugar syrup, addition of artificial comb foundation sheets, bee swarming and its management, crop management for beekeeping, seasonal management, precautions while handling the bees, beekeeping records, management of bee colonies for pollination, advantages of bee pollination.

**Rearing and protection management:** Bee breeding, rearing of queen bees, types of queen rearing, biological basis of queen rearing, selection of mother stock, production of better quality queens, modern methods of queen rearing, queen rearing time table, queen cell builders, instrumental insemination, equipments, scope, benefits of bee breeding, migration of bee colonies, migratory beekeeping problems, various pests and diseases of honey bees and their management.

**Harvesting, processing and marketing of bee products:** Collection of nectar and honey, harvesting of honey, physical and chemical properties of honey, grading of honey, packaging and labelling, uses of honey, storage, honey standards, Indian honey regulations, bee wax-composition and property, processing, uses of bee wax; bee venom- properties, production, uses; propolis- collection technology, properties and uses; royal jelly- properties, production and uses; pollen- composition, pollen collecting technology; marketing of bee products, constraints in honey production, government schemes and policies related to beekeeping.

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<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPCLG2</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Identification of honey bee.
2. Study of equipments used in bee keeping.
3. Study of methods of queen rearing techniques.
4. Study of extraction and processing of honey.
5. Microscopy of different pollens.
6. Study of different diseased condition of honey bees.
7. Identification of pests of honey bees.
8. Study of honey quality.

**Reference Books:**

Chapman: The Insects: structure and function 94<sup>th</sup> 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

<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. III SEMESTER</b>		
<b>Course Title: INSTRUMENTATION AND TECHNIQUES</b>		
<b>Course Code: RTPCTA1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand principle and functioning of various instruments generally used in drug evaluations.
- Enhance their technical skills on slide preparation.

Principle, structure, functioning and applications. Type of microscopy- Light microscopy, Phase contrast microscopy, Fluorescence microscopy, Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM).

Electrophoresis- Principle of electrophoresis, types of electrophoresis, factors affecting migration, staining in gel electrophoresis, application of electrophoresis.

Centrifugation- Principle of centrifugation, Types of centrifuge, Types of rotors, Caring of rotors, Determination of centrifugal force, Sedimentation of cellular organs.

Spectrophotometry- Principle, Functioning and application of colorimetry, UV-Vis spectrophotometry, fluorimetry and atomic absorption spectrophotometry.

Microtomy and Histology- Handling of tissues for pathological studies, Rotary microtome and its working, Fixation and Staining, Histological localization and its significance.

<b>Course Title: LABORATORY COURSE BASED ON THEORY</b>		
<b>Course Code: RTPCLA1</b>	<b>Credit:02</b>	<b>Marks:100</b>

1. Microscopic observations of Biological materials.
2. Separation of biological material using Centrifuge, paper chromatography and electrophoresis.
3. Biochemical analysis of samples using spectrophotometer.
4. Microtomy and preparation of permanent mounts.

**Reference Books**

Techniques in Microscopy and Cell Biology- VK Sharma  
 Stereo, Image processing and Quantitative Image Analysis in Biochemical Research-  
 Shashi Wadhawa and Amit Dinda  
 Introduction to Electron Microscopy III<sup>rd</sup> Ed.-Soul Wischnitzer.  
 An introduction to Electrophoresis- K Anbalgan  
 Electrophoresis- Smith.  
 Instrumental Method of Chemical Analysis- BK Sharma  
 Principles and Techniques of Practical Biochemistry- Keith Wilson and John Walker  
 Laboratory Techniques- Swaroop and Pathak.  
 Instrumental Analysis for Science and Technology-W Faren  
 Instrumental Method of Analysis- Willard Merritt, Dean and Settle

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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. VI SEMESTER</b>		
<b>Course Title: COMPUTER APPLICATION</b>		
<b>Course Code: RTPDTG1</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Learn basics of Hardware and Software.
- Use the computer to prepare various documents.

Elementary knowledge of Computer, Characteristic of computers, Classification of Computers, functions and application, Limitations of computers.

Types of computers, Types of Processors, Input and Output Devices, Memory, volatile and non volatile and cache memory

Hardware and its component, software, network and network topology, Mesh network, star network, ring network, bus network.

Application- MS office: Creating, Editing and saving files; Use of inbuilt Statistical and other functions, Internet, email, video conferencing, e-learning, Edusat, power point presentation.

Computer Applications for Rural Development, constraints, Role of computer education in Rural Development.

**Reference Books:**

Computer organization and design-Pal Chaudhuri

Fundamental of Computers-4th Edition Raja Raman

Fundamental of Graphics and multimedia-Mukharjee

Programming in Basic-3rd edition Bala Guru samy

A Rural Computer consulting Business : John. D. Deans



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<b>SYLLABUS as per LOCF</b>		
<b>M.Sc. VI SEMESTER</b>		
<b>Course Title: ENTREPRENEURSHIP</b>		
<b>Course Code: RTPDTG2</b>	<b>Credit: 04</b>	<b>Marks:100</b>

**Learning outcomes**

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

- Understand entrepreneurship and qualities of an entrepreneur.
- Start SSI/ cottage industries along with the various sources of financial support.

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 a 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

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**M. Sc. IV SEMESTER**

<b>Subject Code: RTPDDC1</b>		<b>Marks:400</b>
<b>Dissertation</b>		

**Dissertation must be compulsory for all students. Students will have liberty to complete his/her 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 bear all expenses.**