

M.Sc. RURAL TECHNOLOGY
(Revised Syllabus w.e.f. the Academic Session 2020-2021)

Course Code	Course Title	Credits (Marks)					
	Semester I	Total	Theory	Tutorial	Practical	Credits	Sessional
SOA/RT/C001	Watershed Management	100	3(60)	-	1(20)	04	20 (10+10)
SOA/RT/C002	Nursery Techniques and Management	100	2(60)	-	1(20)	03	20 (10+10)
SOA/RT/C003	Concepts of Statistics	100	3(60)	-	1(20)	04	20 (10+10)
SOA/RT/C004	Environment and Biodiversity Conservation	100	3(60)	1(20)	-	04	20 (10+10)
SOA/RT/C005	Rural Sociology and Social Welfare	100	2(60)	1(20)	-	03	20 (10+10)
		500	13	2	3	18	
	Semester II						
SOA/RT/C006	Soil Science & Agricultural Chemistry	100	2(60)	-	1(20)	03	20 (10+10)
SOA/RT/C007	Mushroom Cultivation Technique	100	3(60)	-	1(20)	04	20 (10+10)
SOA/RT/C008	Rural Project Planning and Management	100	3(60)	1(20)	-	04	20 (10+10)
SOA/RT/C009	Extension Strategies for Rural Development	100	3(60)	1(20)	-	04	20 (10+10)
SOA/RT/C010	Protected Cultivation	100	2(60)	-	1(20)	03	20(10+10)
		500	13	2	3	18	
	Semester III						
SOA/RT/C011	Medicinal and Aromatic Plants (MAPs)	100	2(60)	-	1(20)	03	20 (10+10)
SOA/RT/C012	Disaster Mitigation and Management	100	2(60)	1(20)	-	03	20 (10+10)
SOA/RT/C013	Information and communication Technology	100	2(60)	1(20)	-	03	20 (10+10)
SOA/RT/E001	Elective Course: Any three of the following a. Innovative Technologies for Rural Development	100	2(60)	-	1(20)	03	20 (10+10)
SOA/RT/E002	b. Rural Marketing and Management	100	2(60)	1(20)	-	03	20(10+10)
SOA/RT/E003	c. Fundamentals of Remote Sensing and GIS	100	2(60)	-	1(20)	03	20 (10+10)
SOA/RT/E004	d. Introductory Agro-meteorology & Climate Change	100	2(60)	1(20)	-	03	20 (10+10)
SOA/RT/SS001	Self Study: Any One of the following • Rural Tourism	100	3(60)	1(20)	-	03	40(20+20)
SOA/RT/SS002	• Rural Health, Sanitation and Water	100	3(60)	1(20)	-	03	40(20+20)
		600	12	3	3	18	
	Semester IV						
SOA/RT/C014	Post harvest Techniques of Fruit and Vegetable	100	2(60)	-	1(20)	03	20 (10+10)
SOA/RT/C015	Master Thesis / Dissertation	100			06	06	
SOA/RT/E005	Elective Course: Any three of the following a. Entrepreneurship Development	100	2(60)	1(20)	-	03	20 (10+10)
SOA/RT/E006	b. Introduction to Apiculture	100	2(60)	-	1(20)	03	20 (10+10)
SOA/RT/E007	c. Rural Energy Resources Management	100	2(60)	1(20)	-	03	20 (10+10)
SOA/RT/E008	d. Environmental Impact Assessment	100	2(60)	1(20)	-	03	20(10+10)
SOA/RT/SS003	Self Study: • Technology Alternative for Rural Housing	100	3(60)	1(20)	-	03	40(20+20)
		500	8	3	7	18	
	Total	2100	46	10	16	72	
	Grand Total Semester I to IV	Core=54+ Elective 18 = 72Credits					

Summary of Credit

Semester	Core Credit	Elective Credit	Self Study	Total Credit
I	18(500)			18(500)
II	18(500)			18(500)
III	9(300)	9(300)	3(100)	18(600)
IV	9(200)	9(300)	3(100)	18(500)
I-IV	54(1500)	18(600)	3(100)	72(2100)

#There will be 02 internal assessments consisting of 10 marks each for each theory paper/ course. However, it can be internal assessment depending on course teacher.

- **In some paper, Instead of practical there will be Term paper/ Seminar in which students will be asked to prepare a paper on a particular topic and present the same in seminar.**
- **Maximum marks for each course: 100 [40 (20 sessional + 20 Practical/Term paper) + 60 End Term Test]**

Important Point from Academic Ordinances

- In order to qualify for a Two-Year Master's degree a student must acquire a minimum of 72 credits including a minimum of 54 credits in Core and 18 credits in Electives course.
- Maximum 9 credits self study course (one minimum 3 Credits course shall be mandatory but not to be included while calculating the grades).

The Distribution of marks for Dissertation/ Project report & Viva-voce will be as below

Master Thesis / Dissertation	60 Marks
Periodical Presentation	20 Marks
Viva-voce	20 Marks
Total	100 Marks

Master Thesis / Dissertation shall be evaluated jointly by Internal and the External Examiner.

SOA/RT/C001: WATERSHED MANAGEMENT

Watershed Management: Definition, size, concept of watershed, effect of watershed on the community, watershed characteristics, objectives of watershed management, selection of watershed, watershed management plan, monitoring and evaluation in watersheds, participatory rural appraisal watershed program (PRA), watershed map, Format for watershed management Plan

Hydrology of Watershed: Precipitation, forms of precipitation, Rainfall pattern in India, Rain fall parameter, Rainfall measurement, Selection of raingauge sites, estimation of runoff, measurement of stream discharge.

Geo-hydrology of Watershed: Availability of ground water, Distribution of subsurface water, soil moisture, aquifer, water table, springs, Ground water recharge, recharges structure, Water harvesting.

Topographic surveying: Elementary surveying equipment, setting out straight lines, setting out contour and graded contour lines and slopes.

Erosion control measures for non agricultural lands: Soil conservation on wastelands, contour and staggered trenching, gully control structures, Check dams

Erosion control measures for agricultural lands: Contour cultivation, contour banding, planning of contour bunds, maintenance of bunds, Graded bunds, advantages and disadvantages, bench terracing.

Practical:

Measurement of stream discharge. Water quality analysis (WQA). Techniques of water harvesting tank. Rainfall measurement, Surveying - Plane Table survey (Radiation and Inter section). Preparation of a watershed development plan (agronomic, physical treatment, social etc.)

Reference Book:

- Integrated Watershed Management: Rajesh Rajora, Rawat Publications, Satyam Apts., Sector-3, Jawahar Nagar, Jaipur- 302004 Indai.
- Watershed management, Guidelines for Indian conditions: E.M. Tideman, Omega Scientific Publishers, B-17, 2nd Floor, Lajpat Nagar Part 2, New Delhi-110024.
- Watershed Management: M.K. Maitra
- Engineering & General Geology: Parbin Singh
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SOA/RT/C002: NURSERY TECHNIQUES & MANAGEMENT

Nursery: Introduction to nursery, Importance and Classification of Nurseries. Establishment of Commercial Nursery Nursery-site selection, lay out, records, Nursery structures.

Nursery management: Progeny orchard, Problems in nursery management and its control, Important Nursery operations - bed Culture, Manure and fertilizers, Irrigation, Protection, Potting, repotting, Lifting, Grading, Storage, Packing and Transportation of nursery plants.

Nursery Propagation: Seed propagation, Germination of seeds, Seed dormancy and viability, Seed testing, Vegetative propagation- cuttings layering, Grafting and budding, Propagation by specialized by stem and roots, stolons, runners, offsets, bulbs, corms, rooted crowns, Micro-propagation.

Practical:

Study of media preparation for growing of plants in nursery beds, pots and in poly houses, preparation of nursery beds and sowing of seeds, rising of seedlings. Practice of vegetative means of propagations of cuttings layering, Grafting and budding. Practice of construction of propagation structures, study of media and PGR. Visit to Commercial nurseries.

Reference Book:

- Hartmann HT & Kester DE. 1989. Plant Propagation – Principles and Practices. Prentice Hall of India.
- Bose TK, Mitra SK & Sadhu MK. 1991. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prokash.
- Peter KV. (Ed.). 2008. Basics of Horticulture. New India Publ. Agency. Singh SP. 1989 Mist Propagation. Metropolitan Book Co.
- Rajan S & Baby LM. 2007. Propagation of Horticultural Crops. New India Publ. Agency. Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.
- Plant propagation, M. K. Sadhu, New Age International Publishers.

SOA/RT/C003: CONCEPTS OF STATISTICS

Data Source- Primary and Secondary data collection methods, Primary data collection method related to questionnaire and interview schedule.

Univariate Analysis: graphical representation of statistical data. an overview of central tendency, dispersion and skewness.

Probability Theory: Probability- classical relative and subjective probability, Addition and multiplication probability models.

Testing of Significance: large and Small sample, Statistical Estimation and Testing , point and interval estimation of population mean proportion and variance, Statistical testing – hypotheses and errors,

sample size, large and small sampling tests – Z test, t test and F test, Chi-square tests, Sign Tests, Correlation and Regression Analysis

Regression: Linear and Non-linear Regression Analysis

Sampling Theory: Statistical decision Theory, Expected profit under uncertainty and certainty, Utility theory Sampling and Data collection: Sampling and sampling (probability and non – probability) methods, sampling and non sampling errors.

Design and Experiment: ANOVA (Analysis of variance) for one way and two ways, LSD; Uses of repeated Latin squares; Missing plot techniques in RBD and LSD; Split-plot design; Multiple comparison tests.

Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom, Confounding in symmetrical factorial experiments, Factorial experiments with control treatment.

Practical:

Fitting of probability distributions, Computation of correlations and regressions, Tests of significance – t, F,Z, X^2 , Exposure to statistical packages SPSS and GENSTAT for ANOVA, multivariate analysis.

Reference Book:

- Fundamentals of Statistics: D.N. Elhance, Veena Elhance, B.M. Aggarwal, Kitab Mahal, 22-A, Sarojini Naidu Marg, Allahabad.
- Mathematical Statistics: J.N. Kapur, H.C. Saxena, S. Chand & Company Ltd., Ram Nagar, New Delhi-110055.
- Fundamental of Mathematical Statistics: Gupta and Kapoor, Sultan And Chand and Sons.
- Theory and Analysis of Sample Survey Design: S. Singh, New Age Enterprises Ltd.
- Statistical Methods- An Introductory Text: Medhi, J., New Age Enterprises Ltd.

SOA/RT/C004: ENVIRONMENT AND BIODIVERSITY CONSERVATION

Climatology: Weather and climate, Control of Climate, The Climate System , Climate Anamoly, Variability and change, Koppen’s classification of Climate, climate of India, clouds and precipitation, Possible Global climate Change, Green house effect, Green house gases, stratospheric ozone, Strategies for protecting stratospheric ozone.

Pollution: definition, causes, effects and control measures of Air pollution, water pollution, soil pollution, Noise pollution, Pollution case studies.

Biodiversity: Definition, levels of biodiversity, uses of biodiversity, distribution of biodiversity, ecological concept, hot-spots of biodiversity, threats of biodiversity, conservation of biodiversity, India's biodiversity and its conservation, endangered threatened and rare species, IUCN red list categories Sustainable development and ecological economics, causes of un-sustainability, national and international programme on sustainable development, sustainability indicators, environmental sustainability index, sustainability development in India.

Practical: Instead of practical, there will be term paper.

Reference Book:

- Ecology Environment and Resource Conservation : J.S. Singh, S.P. Singh, S.R. Gupta, Anamaya Publishers, F-154/2, Lado Sarai, New Delhi-110030, India.
- Climatology An Atmospheric Science : John E. Oliver, John J. Hidore, Dorling Kindersley (India) Pvt. Ltd.
- Climate Change and Global Warming: Avinash Tyagi, Rajat Publications 4675/21, Ansari Road, Daryaganj New Delhi- 110002 (India)
- Cold Climate Hydrometeorology: D.S. Upadhyay, Wiley Eastern Ltd., 4835/24, Ansari Road, Daryaganj, New Delhi- 110002 (India).

SOA/RT/C005: RURAL SOCIOLOGY AND SOCIAL WELFARE

Rural Sociology-Subject Matter and its Importance: Definition and meaning of rural sociology, Elements of rural sociology, Scope of rural sociology, Characteristics of rural society.

Village patterns and modes of living: Origin of villages, Types of villages, Patterns of settlement, Family life, Racial element, Caste system, Rural social institutions in Bharat (Religion, Festivals, Marriage), Place of culture in rural society.

Rural and Urban life: Characteristics of rural society, Characteristics of urban life, Contrast between rural and urban life.

Rural Welfare and Welfare programmes: Concept of social welfare, Welfare organization, Panchayati Raj Institution, Specific programmes for rural area upliftment e.g. JRY, EAS, MWS, IRDP, TRYSEM, DPAP, DDP, MG-NREGA, CAPART, NGOs/Voluntary sector and Land reforms in Bharat.

Groups in villages and their Mobilisation: Definition of group, Nature of group, Type of Groups, Approach of Group, Principles of working with group and their mobilisation

Rural Leadership: Meaning and importance, characteristic, types, Training of rural leadership and qualities of leadership, coordination and team work in rural development.

Practical: Instead of practical, there will be term paper

Reference Book:

- Rural Sociology :Dr. Kumar, Lakshmi Narain Agrwal, Educational Pubilsher, Anupam Plaza-I, Block No. 50, Sanjay Place, Agra-2.
- Extension and Rural Welfare: O.P. Dahama, Ram Prasad & Sons, Hospital Road, Agra-3.
- Rural Sociology: S.L. Doshi, P.C. Jain, Satyam Apts, Sector -3, Jawahar Nagar, Jaipur 302004 (India).
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SEMESTER II

SOA/RT/C006: SOIL SCIENCE & AGRICULTURAL CHEMISTRY

Theory Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution-behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content. Determination of soil texture by Buckman and Brady Methods. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour by Munsell Soil Colour chart. Estimation of organic matter content of soil

Reference Book:

- Engineering & General Geology: **Parbin Singh**, S.K. Kataria & Sons 4424/6, Guru Nanak Market, Nai Sarak, Delhi-110006
- Textbook of Soil Science: **R.K. Mehra**, Agriculture Indian Council of Agricultural Research, Krishi Anusandhan Bhavan, Pusa, New Delhi-110012.
- Principles and Practice of Soil Science: **Robert E. White**, Wiley India Pvt. Ltd. New Delhi.
- Watershed management, Guidelines for Indian conditions: **E.M. Tideman**, Omega Scientific Publishers, B-17, 2nd Floor, Lajpat Nagar Part 2, New Delhi-110024.
- The Nature and Properties of Soil: Brady, N.C. 1990, McMillan, Eurasia.
- Mirada Vigyan Ke Maulik Sidanth (In Hindi): Bhardwaj, V.1997, Hindi Granth Academy, Lucknow.

SOA/RT/C007: MUSHROOM CULTIVATION TECHNIQUE

Introduction to Mushroom, Mushroom Cultivation – History of Mushroom in India and Abroad, Types of edible Mushroom species, Nutritional value of Mushrooms, Medicinal value of mushrooms.

Mushroom Production Technique – Button Mushroom (*Agaricus*), Oyester Mushroom (*Pleurotua*), Paddy Straw Mushroom (*Volvariella*).

Spawn Production Techniques: Preparation of culture, Mother Spawn Production, Multiplication of spawn.

Post Harvest Handling and Preservation of Mushroom: Harvesting and Packaging, Storage of mushroom, Marketing problems in mushrooms, Future prospects of Mushroom in India.

Disease and pest management.

Practical: Identification of different mushroom species, mushroom production, Preparation of medium for mushroom cultivation, spawn mixing, packaging, mushroom recopies.

Reference Book:

- Mushroom: Cultivation and Use , Suman and Sharma, Agrobios India.
- Mushroom Growing, S. C. Day, Agrobios India.
- Mushroom: Production and Processing Technology, Pathak Yadav Gour, Agrobios India.
- Mushroom and their Cultivation Technique, R. C. Ram, Aavishkar Publishers, Distributors, Jaipur India.

SOA/RT/C008: RURAL PROJECT PLANNING AND MANAGEMENT

Concepts of Project Management: Concept of a project, characteristics of a projects, Categories of Project, Project life cycle phases, Project management concepts, Tools and techniques for Project Management, the Project Manager, Project Managers Problems, Roles and Responsibilities of Project manager.

Establishing the Project: Feasibility Report, Financing Arrangements, Preparation of Cost Estimates, Finalisation of Project Implementation Schedule, Evaluation of the Project Profitability, Appointing a Project Manager.

Project Management Process and Project Selection: Objectives, Process of project management, Detailed project report (DPR), Project selection criteria

Project Control Techniques: Objectives , Work break down structures, Gantt charts, Networks, Application of project networks, Network on AOA basis, Network construction, Critical Path Method, Slacks, Floats and their application, Economic and Social Cost Benefit Analysis, Roles of the project manager, Traits of the project manager, Change management, Reasons for pre-completion, termination of the project , Project completion audit , Reasons for project failure, Planning reasons, Leadership reasons, Other reasons, Steps for project success

Practical: Instead of practical, there will be term paper/ assignment

Reference Books

- Goel. B.B (1987): Project Management- A Development Perspective, Deep Deep Publications, New Delhi.
- Nair. B.M (1985): Project Management- Scheduling and Monitoring.
- Maylor Harvey (2000): Project Management, Pitman Publishing.
- Rao. P.C.K: Project Management and Control, Sultan Chand and Sons Publisher, New Delhi.
- Project Management: S. Choudhury, Tata McGraw Hill Education Pvt. Ltd., 7 West Patel Nagar, New Delhi-110008.
- Projects Planning, Analysis, Selection, Financing, Implementation and Review: Prasanna Chandra, Tata McGraw Hill Education Pvt. Ltd., 7 West Patel Nagar, New Delhi-110008.

SOA/RT/C009: EXTENSION STRATEGIES FOR RURAL DEVELOPMENT

Extension Education- Meaning, objectives, concepts, principles and philosophy, critical analysis of definitions- Extension Education as a profession- Adult education and Distance Education Pioneering Extension efforts and their implications in Indian Agricultural Extension- Analysis of Extension systems of ICAR and SAU- State Departments Extension system and NGOs- Role of Extension in Agricultural Universities.

Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Diffusion: Concept and meaning, elements; traditions of research on diffusion, the generation of innovations; innovation-development process; tracing the innovation-development process, converting research into practice.

The adoption process—concept and stages, dynamic nature of stages, covert and overt processes at stages, the innovation-decision process—a critical appraisal of the new formulation.

Practical/ Tutorial

Preparation of questionnaire, Visit to Block/Gram Panchayat to study on-going Rural Development Programmes, Visit to KVK, NGO and Extension centers of ICAR, State Agricultural University and State Departments, Bottom up planning, Prepare a community/village development project. Study of organizational set up & functioning of State Agriculture Departments. Study of indigenous technical know-how about agricultural practices prevalent in rural areas.

Book Reference

- Chandrakandan KM, Senthil Kumar & Swatilaxmi. PS. 2005. Extension Education What? And What Not ? RBSA Publ.
- Gallagher K. 1999. Farmers Field School (FFS) – A Group Extension Process based on Non-Formal Education Methods. Global EPM Facility, FAO.
- Ganesan R, Iqbal IM & Anandaraja N. 2003. Reaching the Unreached: Basics of Extension Education. Associated Publishing Co.
- Jalihal KA & Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension. Concept Publ. Khan
- Chandrakandan KM, Senthil Kumar & Swatilaxmi. PS. . . . 2005. Extension Education What? And What Not ? RBSA Publ.
- Gallagher K. 1999. Farmers Field School (FFS) – A Group Extension Process based on Non-Formal Education Methods . Global EPM Facility, FAO.
- Ganesan R, Iqbal IM & Anandaraja N. 2003. Reaching the Unreached: Basics of Extension Education . Associated Publishing Co.
- Jalihal KA & Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension . Concept Publ.
- Khan PM. 2002. Textbook of Extension Education . Himalaya Publ.

SOA/RT/C010: PROTECTED CULTIVATION

Greenhouse: Importance and scope of protected cultivation, World scenario and Indian situation: present and future prospectus, problems of protected cultivation, Environmental factors and their effects on plant growth.

Basics of greenhouse design, different types of structures—glasshouse, shade, net house, poly tunnels - Design and development of low cost greenhouse structures.

Nursery raising in protected structures like plug-trays nursery, production systems and Media-Geoponics, Soil less media, Hydroponics, Aeroponics, Drip irrigation and fertigation system, role of plastic mulch in protected cultivation.

Greenhouse production: Greenhouse cultivation of tomato, cucumber, muskmelon, capsicum, sweet paper, strawberry, Marigold, Rose, gerbera etc. off seasonal cultivation of vegetables under proteted cultivation, use of protected structures for seed production.

Crop Management in **Greenhouse**: Problem of growing vegetables in protected structures and their remedies, insect and disease management in protected structures,

Practical :

Designs of greenhouse, low cost poly tunnels, nethouse- Regulation of light, temperature, humidity in greenhouses, media, greenhouse cooling systems, ventilation systems, fertigation systems, special management practices, visit to greenhouses.

Reference Book

- Prasad S & Kumar U. 2005. Greenhouse Management for Horticultural Crops. 2nd Ed. Agrobios.
- Tiwari GN. 2003. Green House Technology for Controlled Environment. Narosa Publ. House.
- Post harvest management of horticultural crops
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SEMESTER III

SOA/RT/C011: MEDICINAL AND AROMATIC PLANTS (MAPs)

Introduction of Medicinal and Aromatic Plants: Importance and needs of cultivation of Medicinal and Aromatic plants, Nutritional value, Scope, Development and future prospect , Area and production, Export potential of medicinal and Aromatic plants, medicinal plants found in Uttarakhand.

Origin, distribution, morphological features, climatic and soil requirements, classification, propagation and nursery techniques, transplanting, after care, Harvesting and post-harvest processing, and uses of the following medicinal and aromatic plants.

Medicinal Plants: Amla, Shankpuspi, Brahmi, Chirayita, Arjuna, Kutki, Harad, Tulsi, Ashwagandha, Aloe-Vera, Sarpandha, Isubgol, Kuth, Jatamansi, Garlic, Ginger, Turmeric, Black pepper, Coriander, Fenugreek, Clove and other species related to local condition.

Aromatic Plants: Lemon grass, Lavender grass, Citronella grass, Geranium, Ocimum, Mentha, Eucalyptus and other species related to local conditions of Uttarakhand.

Improvement and conservation of medicinal plants, breeding technique for medicinal plant improvement, domestication, rear and endangered medicinal plants.

Practical:

Preparation and layout of nursery and field area, preparation of root and shoot cuttings, Methods of seed sowing, Irrigation techniques, Identification of valuable Medicinal Plants, Related indigenous knowledge, Nursery raising techniques, Planting and care, Harvesting, Storage and Preservation of MAPs, Habitat study of MAPs, Herbarium preparation, Cultivation techniques

Reference Book:

- A Handbook of Medicinal Plants: A Complete Source Book: Prajapati/ Purohit/ Sharms/ Kumar, Agrobios India.
- Herbal and Medicinal Plants of India: Dr. D. K. Bhatt/ Dr. Aparna Raj/ Kiran Bhatt, Shree Publishers and Distributors, New Delhi.
- Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants: N. Kumar/ JBM Md. Abdul Khader/ P. Rangaswami/ I. Irulappan, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

SOA/RT/C012: DISASTER MITIGATION AND MANAGEMENT

Natural Disaster: Definition, types of disaster, disaster profile of India, Disaster management cycle and mitigation.

Earthquake Disaster: Earthquake, classification of earthquakes, causes of earthquakes, effect of earthquakes, quake resistant buildings, pre and post disaster planning and management of earthquakes.

Landslide Hazards: Landslide, classification of landslide, causes of landslide, monitoring and control of landslides.

Floods Control: Floods and stream bank erosion disaster

Snow Hazards in Himalaya: definition, terrain features for avalanche formation, classification of avalanches, avalanche protective measures, avalanche warning system.

Forest Fire: Introduction, Types of forest fire, Causes of forest fire, Effect of fire on soil.

Practical: Instead of practical, there will be term paper/ assignment

Reference Book:

- Disaster Management In 21st Century: B.C. Bose, Rajat Publication , 4675/21, Ansari Road, Dariyaganj New Delhi-110002.
- Disaster Management and Development Interface: Dr. Aaradhana Salpekar, Dr. kadambari Sharma, Jnanada Prakashan., 4675/21, Ansari Road, Dariyaganj New Delhi-110002.
- Management of Major Disasters: Dr. Aaradhana Salpekar, Er. Anil K. Jamwal, Jnanada Prakashan., 4675/21, Ansari Road, Dariyaganj New Delhi-110002.
- Earthquake Prediction: Haroun Tazieff, McGraw-Hill, Inc.
- Engineering & General Geology: Parbin Singh, S.K. Kataria & Sons 4424/6, Guru Nanak Market, Nai Sarak, Delhi-110006

SOA/RT/C013: INFORMATION AND COMMUNICATION TECHNOLOGY

Communication process – concept, elements and their characteristics – Models and theories of communication - Communication skills – fidelity of communication, communication competence and empathy, communication effectiveness and credibility, feedback in communication, social networks and development communication – Barriers in communication, Message – Meaning, dimensions of a message, characteristics of a good message, Message treatment and effectiveness, distortion of message.

Methods of communication – Meaning and functions, classification, Forms of communication – Oral and written communication, Non-verbal communication, interpersonal communication, organizational communication, Key communicators – Meaning, characteristics and their role in development.

Media in communication- Role of mass media in dissemination of farm technology, Effect of media mix for rural people, Modern communication media – Electronic video, Tele text, Tele conference, Computer associated instruction, Computer technology and its implications.

Agricultural Journalism as a means of mass communication, Its form and role in rural development, Basics of writing – News stories, feature articles, magazine articles, farm bulletins and folders. Techniques of collection of materials for news stories and feature articles; Rewriting Art of clear writing, Readability and comprehension of testing procedures; Photo journalism, communicating with pictures, Radio and TV journalism, Techniques of writing scripts for Radio and TV.

Book Reference

- Dahama OP & Bhatnagar OP. 2005. Education and Communication for Development. Oxford & IBH. Grover I, Kaushik S, Yadav L & Varma SK. 2002. Communication and Instructional Technology. Agrotech Publ. Academy.
- Jana BL & Mitra KP. 2005. Farm Journalism. Agrotech Publ. Academy.
- Ray GL. 2006. Extension Communication and Management. Kalyani Publ. Rayud
- Ray GL. 2006. Extension Communication and Management . Kalyani Publ.
- Van Den Ban AW & Hawkins HS. 1998. Agricultural Extension .2nd Ed. CBS.
- Viswanathan M. 1994. Women in Agriculture and Rural Development . Printwell Publ.
- Jitendra Chauhan, 2012. Prasar Siksha Avem Suchna Tantra, Eisha Publication, Agra
- Jitendra Chauhan, 2012. Communication and Extension Management, Anjali prakashan, Kanpur
- O.P. Dahama,97. Extension and Rural Welfare, Ram Prasad & Sons, Agra

Elective Course:

SOA/RT/E001: INNOVATIVE TECHNOLOGIES FOR RURAL DEVELOPMENT

Vermi Technology: Earthworm classification, Species, External and internal features of verms, Use of earthworms, vermicomposting materials, requirement of vermiculture and vermicomposting, Factors affecting earth worm's growth, Types of vermicomposting, methods of vermicomposting, Harvesting and storage of vermicompost, advantages of vermicompost, Use and benefits of Vermicompost, Effect of vermicompost on plants, chemical composition of vermicompost, vermiwash (worm-tea), Chemical composition of vermiwash, Use and advantages of vermiwash.

Biocomposting: methods of biocomposting, decomposition process, difference between biocompost and Farm yard manure (FYM), Materials used in biocompost, advantages of biocompost. Precaution needed for compost preparation.

NADEP Compost: Preparation of NADEP compost, construction and design of NadeP compost tank, Material use for preparation of NadeP compost, Substrate use for the production of compost.

Organic Farming: Definition, its components, importance and certification.

Practical:

Study the pit construction, different types of worms used for vermicompost, pit installation, compost preparation, removal of compost from the pit and reinstallation, Preparation of NadeP compost.

Reference Book:

- Vermiculture and Organic Farming, T. V. Sathe, Daya Publishing House, New Delhi.
- A Hand book of Organic Farming: Arun K Sharma Agro bios Inida, New Delhi.

SOA/RT/E002: RURAL MARKETING AND MANAGEMENT

Rural Marketing: Definition, Nature, Scope and importance distinction between marketing, selling distribution and evolution of market components and classification of market, Five Ps, Marketing goals, marketing practices, challenges in Indian Rural Marketing.

Marketing Analysis: Marketing environment, macro and micro component and their impact, marketing organization, marketing components and their impact, marketing research, meaning, nature and scope, objectives, marketing research procedure.

Co –operatives: Meaning and Definition of Co-operative movement in India, Basic principles of Co-operative and other lead Bank Agriculture credit societies and its function

Co-operative Marketing: Meaning, definition, Importance, objectives, advantages, need, structure and organization of marketing societies, its financing patterns, critical evaluation of co-operative marketing

Financing: Introduction of rural financing, finance requirements for production and marketing function, source of finance, national level credit Agency-NABARD, Function of NABARD, Schemes and Patterns of NABARD.

Practical: Instead of practical, there will be term paper/ assignment

Reference Book:

- Rural Marketing: R.V. Badi, N.V. Badi, Himalaya Publishing House, Ramdoor, Dr. Bhalerao Marg, Girgaon, Mumbai-400004.
- Indian Economy: Misra, Puri, Himalaya Publishing House, Ramdoor, Dr. Bhalerao Marg, Girgaon, Mumbai-400004.
- Rural Marketing (Environment, Problems and Strategies): T.P. Gopaldaswamy, Vikas Publishing House Pvt. Ltd, A-22, Sector-4, Noida-201301 (UP).
- Case in Rural Marketing an Integrated Approach: CSG Krishnamacharyulu, Lalitha Ramakrishnan, Dorling Kindersley (India), Pvt. Ltd.,

SOA/RT/E003: FUNDAMENTALS OF REMOTE SENSING AND GIS

Remote Sensing: Fundamental & concept of remote sensing, Electromagnetic Energy, Energy interaction with Earth surface features, Spectral response of natural earth surface features. Sensor systems used in remote sensing: Passive system, Active system, spectral enhancement techniques – NDVI, NDWI

Aerial Photography: Types of Aerial photographs, how aerial photographs are taken. Errors in flying, Geometry of Aerial photographs, aerial camera, aerial film negative, Stereoscopes, How to order fresh photography.

Global Positioning System: Introduction, space segment, ground control segment, user segment, errors in GPS, applications of GPS.

Principles of Geographic Information System (GIS): Definition, GIS applications, Components of GIS, geographically referenced data, spatial data, attribute data, GIS operations, Types of data structure, Raster and Vector formats, Advantages and disadvantages of various data structure.

Spatial Objects: Points, lines, polygons, relationships between spatial objects, adjacency, connectivity, containment, digital elevation models (DEM)

Data Input: Method of data capture, digitization and scanning methods, data output.

Practical:

Practical on photogrammetry, Visual interpretation of aerial photos on different scale, tracing of details from stereo pair, Georeferencing, GPS field study.

Reference Book:

- An Introduction to Geographical Information Systems: Ian Heywood, Sarah Connelius, Steve Carver, Srinivasa Raju, Dorling Kindersley (India) Pvt. Ltd.
- Concepts and Techniques of Geographic Information Systems: C.P.Lo. Albert, K.E. Yeung, PHI Learning Pvt. Ltd. New Delhi-110001.
- Geographical Introduction Science: Narayan Panigrahi, Universities Press (India) Pvt. Ltd.
- Remote Sensing in Geology: SM. Ramasamy, Rawat Publications, Jaipur and New Delhi.
- Remote Sensing and Image Interpretation: Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman, Wiley India, Pvt. Ltd. Daryaganj New Delhi.
- Geographic Information Systems and Science: Paul A. Longley, Michael F. Good child, David J. Maguire, David W. Rhind, John Wiley & Sons, Ltd.

SOA/RT/E004: INTRODUCTORY AGRO-METEOROLOGY & CLIMATE CHANGE

Introduction: Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;

Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature,

Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave.

Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical Visit of Agro meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation. Measurement of albedo. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration

Reference Book:

- Agrometeorology, S.R. Reddy and D.S. Reddy, Kalyani Publishers New Dehli, 2015
- Agricultural Meteorology” by Rao and Prasada.
- Textbook of Agricultural Meteorology” by M C Varshneya
- Agricultural Meteorology, the Effect of Weather on Crops” by J W B 1863 Smith

SELF STUDY:

SOA/RT/SS001: RURAL TOURISM

Introduction, Tourism, types of tourism, tourism in world, in India, in Uttarkahand, tourism in past, present trends and foresight models of tourism, tourism & sustainable development, sustainable tourism, social tourism, rural tourism. Market share of tourism in world market, world tourism day & motto, Rural tourism & India.

Rural Tourism in India, its scope & importance, rural society of India, cultural aspects of India & tourism, Models of sustainable tourism in India, Rural Tourism components & types of rural tourism.

Economics of tourism, GDP share of tourism in India. Opportunities for development of rural tourism, Challenges in development of rural tourism, benefits & hazards of rural tourism, rural tourism & employment generation in rural India.

Development of rural tourism, selection of theme, selection of site, planning of rural tourism theme, execution of rural tourism theme, promotion & marketing of rural tourism theme, management of resources, security & service, guests feedback.

Practical: Instead of practical, there will be term paper/ assignment.

Suggested Readings

1. Rural Tourism, by R. Prudhi
2. Rural Tourism and Tribal Development 1 December 2006 by S.B. Verma and S.K. Jiloka
3. Rural Tourism: New Concepts, New Research, New Practice 19 September 2017 by Bernard Lane and Elisabeth Kastenholz
4. International rural tourism development: an Asia-Pacific perspective 1 July 2017 by World Tourism Organization

SOA/RT/SS002: RURAL HEALTH, SANITATION AND WATER

Rural Health: Historical development of health services in rural India, Pre – independence period, Post-independence period, Objectives and scope of present health services in India, Common health problems of rural communities

Sanitation & Water Supply: Problem in environmental sanitation, Introduction to rural ecology and environment, housing ventilation, Drinking Water Disposal of human, animal waste.

Drinking Water: Source, surface, sub-surface (ground) Laboratory analysis of the quality of water Chemical parameter, Methods of infection of water, Rural water supply schemes & their implementation Various appropriate technology for providing potable drinking water.

Rural Waste Management: Necessity of Systematic collection and disposal of waste. Brief description of sewage disposal system sewerage system.

Practical: Instead of practical, there will be term paper/ assignment.

Reference Book:

- Rural Health Care and Housing: S.B Verma, S.K. Jiloka, A.C. Pathak, Deep & Deep Pub. New Delhi
- Water of India (Quality and Quantity): G.K. Ghosh, APH Publishing, New Delhi
- Water Management in India: M. Dinesh Kumar, Gyan Publishing House, New Delhi
- Waste Management, Rajiv K. Sinha, Er. Ambuj K. Sinha, INA Shri Publisher, Jaypur
- Management of Water Resources in Agriculture: U.S. Sree Ramulu, New Age International Publisher, N. Delhi
- Health Problems of Rural Population in India: Suresh Sharma, APH Publishing corporation N. Delhi

SEMESTER IV

SOA/RT/C014: POSTHARVEST TECHNOLOGY OF FRUITS & VEGETABLES

Introduction: Importance and scope and of fruit and vegetables preservation industry in India, Principles and methods of preservation.

Causes of Post Harvest Losses: control of post harvest losses- proper cultural operations, maturity indices of fruits and vegetables, pre-storage treatments, transportation, storage, environmental control, ionizing radiation, post harvest chemical treatments.

Value Addition: General methods of making Jam, Jelly, marmalades, fruit juices, Pickles, Sauce and chutney, Canning and Bottling, Food spoilage.

Drying/ Dehydration of Fruit and Vegetables: Natural or home drying, commercial dehydration.

Freezing of Fruit and Vegetables: freezing process, methods of freezing.

Marketing: Principles and guidelines for establishment of processing unit. Rural entrepreneurship development for preservation of fruit, vegetables and their products. Quality management for fresh marketing, Marketing of fruits and vegetables and their products, Quality control in food processing- HACCP. List of machineries used in processing industries.

Practical: Identification of equipments used in preservation, preparation of jam, jelly, squash, juice, chutney, sauce, pickles, estimation of acidity , vitamins C , sugar, T.S.S., and juice content, visit to processing factories.

Reference Book:

- Fruit and Vegetable Preservation, Principles and Practices: R. P. Srivastava/ Sanjeev Kumar, International Book Distributing Co.
- Post Harvest Management and Processing of fruit and Vegetables- Instant notes: Satish Kumar Sharma, New India Publishing Agency, Pitam Pura, New Delhi.
- Practical Manual Series-2: Post Harvest technology of Horticultural Crops: S. K. Sharma/ M. C. Nautiyal, New India Publishing Agency, Pritam Pura, New Delhi.

SOA/RT/C015: MASTER THESIS / DISSERTATION

Elective Course:

SOA/RT/E005: ENTREPRENEURSHIP DEVELOPMENT

Entrepreneur: Introduction, Concept, characteristics, function, need, type of entrepreneur, Intrapreneur, Social entrepreneur

Rural Entrepreneurship: Meaning, concept, need, Evaluation of Entrepreneurship in India, role of entrepreneurship in economic development, Rural Infrastructure and industrialization,

progress and problem of rural industrialization in Indian Rural Approach, role of entrepreneurship in economic development.

Factor Affecting Entrepreneurship Growth: Economic Factors, Non-economic Factors, Government Action, Entrepreneurship Development Programmes (EDPs),

Micro, Small and Medium Enterprises (MSME): Meaning, scope, objectives, essentials features, characteristics and role of micro, small and medium enterprises (MSME) in economic development.

Financial Management: Source of finance, Capital Structure, Capitalisation, Term Loans, Sources of short term finance, Institutional finance and institutional support to small entrepreneurs.

Practical: Instead of practical, there will be term paper

Reference Book:

- Entrepreneurship Development: SS Khanka, S. Chand and Company Limited, New Delhi 2017
- Entrepreneurship: Robert D Hisrich, Michael P Peters, Dean A Shepherd, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
- Entrepreneurship: Dr. Richard, M. Hodgetts, Chennai Micro Print Pvt. Ltd. (Export Division) 100% EOU, No.130, Nelson Manickam Road Aminjikarai.
- Entrepreneurship Development and Communication Skills: R.R. Chole, P.S. Kapse & P.R. Deshmukh, Scientific Publishers (India) 5 A, New Delhi, P.O. Box 91, Jodhpur 342001 India.
- Entrepreneurship Development Programme in India and its Relevance to Developing Countries, Patel V.G., Entrepreneurship Development Institute of India, Ahmadabad.
- K.V.I.C. Khadi and Village Industries – The Gandhian Approach
- Mehan, K.K. Small Industry Entrepreneurs Handbook
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SOA/RT/E006: INTRODUCTION TO APICULTURE

Introduction to Apiculture: Definition of apiculture, Importance and future prospects of apiculture, History of apiculture industries in India and world.

Origin and Classification of Bee: Origin, Classification and its silent feature, Species of honeybee and their castes.

Equipments and Appliances: Bee Hive, Comb, other appliances for bee keeping.

Life cycle: Developmental stages of Honey Bees (Egg, Larva, Pupa and Adult) and division of labour, Honey bee senses, Resource needs of the colony, Artificial feeding of honeybees.

Anatomy of Honey Bees: External anatomy and internal anatomy of bee, Importance of bees in human life.

Properties of Honey: Physical and chemical properties of honey, Honey bee products and their values.

Extraction of Honey: Extraction handling, processing and storage of honey, Granulation and fermentation of honey, Hydroxy- methyl-furfural (HMF) value.

Honey Processing Unit: Design of honey processing unit.

Diseases Management: Enemies of honeybees, Diseases in apiculture

Practical: Study the techniques of bee keeping and identification of related equipments, colony formulation, identification of Caste, feeding, honey extraction, migration.

Reference Book:

- A handbook of Beekeeping: Dharm Singh/ Devendra Pratap Singh, Agrobios, India.
- Beekeeping: . E. F. Phillips, Agro bios, India.

SOA/RT/E007: RURAL ENERGY RESOURCES MANAGEMENT

Source of Energy: Definition, energy options, Types of alternative sources of energy (conventional and non- conventional).

Introductory bio Energy: Energy sources and overall energy demand and availability, Energy Consumption and its changing pattern, Renewable sources in India, their utilization pattern in the past, present and future projections of consumption pattern, Energy and Environmental policies.

Bio Fuels: Biomass, its classification, characteristics and utilization, techniques for biomass assessment, biomass estimation, Properties of biomass, Types of bio fuels (liquid, solid and gas), Importance of production processes and technology, bio-fuels applications, bio-fuels for transportation.

Biomass Gasifier and Biogas: Importance of biogas, different types of biogas plant, various substrates used to produce biogas, biogas gasifier and types, application of gasifier to the power and engines, technology.

Bio-briquetting: Procedure for setting up a briquetting plant, economic analyses of briquetting, application for biomass briquettes.

Practical:

Instead of practical, there will be term paper/ assignment

Reference Book:

- Non- Conventional Energy Sources: G.D. Rai, Khanna Publishers, 2-B, Nath Market, Nai Sarak Delhi-110006.
- Solar Energy the Infinite Source: G.K. Ghosh, Ashish Publishing House, 8/81, Punjabi Bagh, New Delhi- 110026.

- Rural Energy Management: Sushma Kaushik, Tej Verma, Deep & Deep Publications, F-159, Rajouri Garden, New Delhi-110027.
- Rural Energy (Consumption, Problems and Prospects): D.R. Veena, Ashish Publishing House, 8/81, Punjabi Bagh, New Delhi- 110026.
- Non- Conventional Energy Systems: S.K. Agarwal, A.P.H. Publishing Corporation New Delhi- 110002.

SOA/RT/E008: ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Introduction: principles and purpose of IEE and EIA and its significance for the society, Cost and benefits of EIA. EIA involvement during project life cycle. EIA management, principles and management of EIA, main stages in EIA techniques, checklists, scooping, prediction, mitigation and alternatives auditing. EIA techniques, checklists, matrices, network method, remote sensing and GIS. Public consultation in EIA and SEA(Strategic Environmental Assessment).

Practical: Instead of practical, there will be term paper/ assignment

Reference Book:

- Ecology Environment and Resource Conservation : J.S. Singh, S.P. Singh, S.R. Gupt, Anamaya Publishers, F-154/2, Lado Sarai, New Delhi-110030, India.
- Strategic Environmental Assessment, A Source Book and reference guide to International Experience: Barry Dalal, Clayton & Barry Sadler, Earthscan U.K
- Environment Impact Assessment: Peter Morris & Riki Therivel.

SELF STUDY

SOA/RT/SS003: TECHNOLOGY ALTERNATIVE FOR RURAL HOUSING

Low Cost Housing System: Types of Rural houses & their patterns, Socio-economic aspects of housing, modes of living households, Size & economic status.

Building Materials: Locally available material & their characterization, Sun dried bricks, Lime, Sand, Wood, Techniques for exploitations of locally available materials, Characteristics & utility of improved material, Stabilized soil blocks, agro based material, rice husk (cement),fly, ash, ferro-cement, light weight aggregate, comparative cost study.

Earthquake Resistance Housing: Basic concept & principles, Design and Foundation, Traditional, Modern methods for earthquake housing system mud walls, their thickness for load , water penetration in mud , sun dried bricks, Pucca bricks, Bamboo reinforced walls, Finishing of walls with plaster, Water proofing techniques for walls.

Roofing System: Kachacha & Pucca: Thatch (treatment methods for improving the durability / fire retendent) Details of various types of low cost prefabricated roofing viz- brick, panel, doubly curved unit . Door, windows & other opening: different types with complete details & cost ratios: wooden / RCC / Ferro cement etc .

Practical: Instead of practical, there will be term paper/ assignment

Reference Book:

- Low Income Rural Housing (A Model for Govt. Policy and Action), D. R. Veena, Ashish Publishing House, N. Delhi
- Rural Housing: Shilja N. Ambedkar, Agrobios (Inda), N. Delhi
- Engineering & General Geology: Parbin Singh, S.K. Kataria and Sons N. Delhi
- Technical Report/ Survey Report on Rural Houses and Construction techniques in hilly areas, CBRI, Roorkee
- Technical note on “improved technique of making thatch roof” CBRI, Roorkee
- Appropriate Technology for housing the poor by Narendra Verma, CBRI, Roorkee
- Survey Report on Present Practice in Rural Houses, CBRI, Roorkee.