DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/Sci./University Deptt./NEP/93/2024

It is hereby inform to all concerned that, the syllabi prepared by the Ad-hoc Board and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted** the following Syllabi under the Faculty of Science & Technology **as per Norms of National Education Policy – 2020 run at University Department, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapathi Sambhajinagar** as appended herewith.

Sr.No.	Syllabi of the Department.	Semester
1.	M.Sc.Rural Technology	IInd Semester
2.	M.Sc.Coservation of Biodiversity	IInd Semester

This is effective from the Academic Year 2023-24 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/NEP/2024/26439-47
Date:- 18.05.2024.

★★★★★

Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

1] **Head of the Department/Director, Department of Gopinathrao Munde National Institute of Rural Development & Research,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
2] **The Director, University Network & Information Centre, UNIC**, with a request to upload this Circular on University Website.

Copy to :-

1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
2] The Section Officer,[M.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, CHHATRAPATI SAMBHAJINAGAR

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT AND RESEARCH

Reaccredited with 'A' Grade

FACULTY OF SCIENCE & TECHNOLOGY

2 Years P.G. Programme in Science

(M.Sc.)

As per National Education Policy - 2020

(To be implemented from Academic Year - 2023-24)

Course Structure and Curriculum

(Outcome based Credit System)

Subject: Rural Technology

(Effective from 2023-24)

Dean Faculty of Science & Technology Dr. Babasaheb Ambedkar Marathwada University Chhatrapati Sambhajinagar

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1. Preamble

Rural development needs an integration of all areas of knowledge. It needs multi-disciplinary approach towards the rural development ideology. The GMNIRD is committed to empower the youth for rural development by catering the needs of the rural development. It will integrate all local institutions, industries, and organizations in the vicinity for the universal coordination of knowledge for overall rural growth & development. Under the Gopinathrao Munde National Institute of Rural Development & Research (GMNIRD) a new syllabus is designed as per New National Education Policy 2020 (NEP – 2020) for Master of Science in Conservation of Biodiversity is to be implemented from the academic year 2023-24 onwards in GMNIRD of Dr. Babasaheb Ambedkar Marathwada University, Chh. Sambhajinagar.

The GMNIRD is established in the Dr. Babasaheb Ambedkar Marathwada University campus as one of the constituent Institute for conducting academic, research, training and extension activities associated with the rural development and management. It is a multidisciplinary Institute covering all disciplines of science, technology, social sciences, agricultural sciences, trade and managerial subjects.

The role of higher education is vital in securing the gainful employment and providing further access to higher education comparable to the best available in the world-class institutions elsewhere. The improvement in the quality of higher education, therefore, deserves to be given tom-most priority to enable the young generation of students to acquire skill, training, and knowledge to enhance their thinking, comprehension and application abilities and prepare them to compete, succeed and excel globally. Sustained initiatives are required to reform the present higher education system for improving and upgrading the academic resources and learning environments by raising the quality of teaching and standards of achievements in learning outcomes across all undergraduate programs in science, humanities, commerce, and professional streams of higher education. One of the significant reforms in the undergraduate education is to introduce the Learning Outcomes based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome oriented with well-defined aims, objectives, and goals to achieve. The University Grants Commission (UGC) took the initiative of implementing the LOCF in the Colleges and the Universities of the country. Accordingly, the University of Kerala has decided to implement the LOCF in all its departments under the auspices of Internal Quality Assurance Cell (IQAC). A series of teacher training workshops were organised by IQAC and the office of the Credit and Semester System (CSS), and the departments have revised the syllabus accordingly, through workshops and in consultation with academic experts in the field.

2. Vision

1. Improving the quality of life of the rural population.
2. To improve the infrastructure of the rural areas.
3. To reduce unemployment by providing opportunities for employment.
4. To provide clean water, electricity, employment, and proper communication for rural development.
5. To ensure an improvement in the underprivileged populations standard of living.

3. Mission

1. To achieve enhanced crop production for rural areas.
2. To bring about a greater socio-economic equity.
3. To bring about a spatial balance in socio-economic development.
4. To bring about improvement in the ecological environment.
5. To develop bread-based community participation for the rural development.

4. General Objectives of the Course

1. To serve as a national and regional hub of knowledge connectivity for rural development.
2. To support developmental plans and policies for rural development by research, training and demonstration and create functioning packages of social and physical technologies and economic policy strategies.
3. To facilitate the development of techno-managerial cadres needed for the rural development.
4. To create innovative academic programmes. At the same time, evolve HRD package (including training) suitable for the development of the region.
5. To help create special institutional structures and schemes for nurturing the leadership in regional development/ Agripreneur / Coopreneurship with special focus on the most Socio-economically backward and drought regions.

5. Programme Objectives

1. The Programme has been framed to provide an understanding and experience of different aspects of Rural Development.
2. It is to provide a holistic perspective of schemes/programmes of central govt. in general and particular in state government.
3. It is innovative, skill and employment oriented to attract bright students to the discipline of rural development.

6. Learning Objectives

1. The course will cover conservation and biodiversity at both the population and ecosystem level with focus on ecological and evolutionary processes and their interactions.
2. Relevant principles from behavioural ecology, population ecology, genetics and evolution will be related to conservation biology and biodiversity.
3. Both the theoretical foundations of conservation biology and empirical examples will be covered.

7. Programme Specific Objectives (PSOs)

1. Mastery in biodiversity and its conservation strategies.
2. Experience and identify the diversity of plant and animal kingdom, from lower to higher level.
3. Recognize the need to conserve the wealth of Biodiversity.
4. Address environmental issues related to biodiversity.
5. Create social awareness in biodiversity conservation and sustainable utilization of bio-resources.

8. Eligibility

1. Candidates who have passed any bachelor's degree [10+2+3/4] of Science, Engineering, Agriculture, and any other equivalent degree of statutory University recognized equivalent thereto must have obtained minimum aggregate **50** per cent marks for open categories and minimum **45** per cent marks for reserved categories.
2. He/ She should have passed the Entrance Test conducted by the University with the specified criteria.

9. Intake Capacity

Admissions for 30 students are available in the first Semester at the beginning of the academic year.

10. Duration

1. The course shall be a Post-Graduate Full Time Course.
2. The duration of course shall be of Two years with Four Semesters.
3. Maximum Period for Completion of Programme would be four years.

11. Medium of Instruction

The medium of instruction shall be in English.

12. Course Structure (Marking Scheme)

Total Marks for PG Programme will be 2200.

Two-Year Post-graduate Program

Course and Credits Distribution of Two years Master's Degree Program with Entry & Exit option

Faculty of Science and Technology

Year / level	Sem.	Major subject		RM	OJT /FP	RP	Credits	Degree
		DSC Core Mandatory	DSE (Elective)					
First year/ 6.0	I	3(4) +2=14	4	4			22	PG Diploma (After 3 years degree)
	II	3(4) +2=14	4		4		22	
Cum. Cr. For PG Diploma		28	08	4	4		44	
Exit option with Post-graduate Diploma (44 credits) after first year or two semesters with completion of courses equivalent to 44 credits								
Second Year /6.5	III	3(4) +2=14	4			4	22	PG Degree after 3 years UG or PG Degree after 4 years UG
	IV	3 (4) = 12	4			6	22	
Cum. Cr. For 1 year PG Degree		26	8			10	44	
Cum. Cr. For 2 years PG Degree		54	16	4	4	10	88	
2 Years -4 sem.PG Degree (88 credits) after three-year UG Degree or 1 Year -2 sem. PG Degree (44 credits) after four year UG degree								

ABBREVIATION:

Major – Comprising Mandatory –is based on specialization

DSE- Discipline Specific Elective

OJT – On-the- Job Training

FP – Field Project Corresponding to the Major (Core) Subject

RP – Research Project Corresponding to the Major (Core) Subject

Internship/Apprenticeship - Corresponding to the Major (Core) Subject

Note-

1. The workload relating to a course is measured in terms of credits hours.
2. A credit is a unit by which the coursework is measured
3. Each course may have –
    a. only lectures-
    b. lecture and tutorial –
    c. lecture and practicum
    d. lecture, tutorial and practice components
4. One credit- one clock hour lecture in a week.
5. Three credits lecture course in a semester means three one-hour lectures per week.
6. In semester of 15 weeks duration = tree credit lecture course is equivalent to 45 hours of teaching in a semester.
7. One credit for tutorial means one hour of engagement per week. In a semester 15 weeks duration – a one credit tutorial in a course is equivalent to 15 hours engagement.
8. A one credit course for- practical/lab work/ community enjoyment program/filed work /seminar/internship /project in a semester means two-hour engagement per week.
9. In a semester of 15 weeks duration a one credit practical in course is equivalent to 30 hours.
10. 1 Credits =25 Marks

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13. Course Structure

AS PER NEP 2020

Illustrative Credit distribution structure for Two Years Master's Degree Programme with Multiple Entry and Exit options –

Class: M. Sc. First Year Semester: I Subject: Rural Technology

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory DSC	MRT/MJ/500-T	Natural Rural Resources	3	-	3	-	14
	MRT/MJ/501-T	Crop Production Technology	3		3	-	
	MRT/MJ/502-T	Irrigation Technology	3	-	3	-	
	MRT/MJ/503-P	Lab-I: Natural Rural Resources		2		1	
	MRT/MJ/504-P	Lab-II: Crop Production Technology		2		1	
	MRT/MJ/505-P	Lab-III: Irrigation Technology	-	2	-	1	
	MRT/MJ/506-P	Skill Based : Indigenous Technical Knowledge System	-	4	-	2	
DSE (Choose any one from pool of courses)	MRT/DSE/507-T	Fundamentals of Biodiversity and Conservation	3		3		04
	MRT/DSE/508-P	Lab-IV: Fundamentals of Biodiversity and Conservation		2		1	
	or	**or**					
	MRT/DSE/509-T	Watershed Management - I	3		3		
	MRT/DSE/510-P	Lab-IV: Watershed Management - I		2		1	
	or	**or**					
	MRT/DSE/511-T	Animal Husbandry	3		3		
	MRT/DSE/512-P	Lab-IV: Animal Husbandry		2		1	
RM	MRT/RM/513-T	Research Methodology	4	-	4	-	04
			16	12	16	06	22 Credits

AS PER NEP 2020

Illustrative Credit distribution structure for Two Years Master's Degree Programme with Multiple Entry and Exit options –

Class: M. Sc. First Year Semester: II Subject: Rural Technology

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory DSC	MRT/MJ/550-T	Commercial Plant Breeding	3		3		14
	MRT/MJ/551-T	Food Processing Technology-I	3		3		
	MRT/MJ/552-T	Drying of Farm Crops	3		3		
	MRT/MJ/553-T	Rural Health Management	2		2		
	MRT/MJ/554-P	Lab-I: Commercial Plant Breeding		2		1	
	MRT/MJ/555-P	Lab-II: Food Processing Technology-I		2		1	
	MRT/MJ/556-P	Lab-III: Drying of Farm Crops		2		1	
DSE (Choose any one from pool of courses)	MRT/DSE/557-T	Green House Technology	3		3		04
	MRT/DSE/558-P	Lab-IV: Green House Technology		2		1	
	or	**or**					
	MRT/DSE/559-T	Nursery Techniques Management	3		3		
	MRT/DSE/560-P	Lab-IV: Nursery Techniques Management		2		1	
	or	**or**					
	MRT/DSE/561-T	Climate Change	3		3		
	MRT/DSE/562-P	Lab-IV: Climate Change		2		1	
OJT/FP	MRT/OJT/FP/563-P	On Job Training/Field Project	-	8	-	4	04
			14	**16**	**14**	**08**	**22 Credits**

AS PER NEP 2020

Illustrative Credit distribution structure for Two Years Master's Degree Programme with Multiple Entry and Exit options –

Class: M. Sc. First Year Semester: III Subject: Rural Technology

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory DSC	MRT/MJ/600-T	Watershed Management –II	3		3		14
	MRT/MJ/601-T	Food Processing Technology-II	3		3		
	MRT/MJ/602-T	Rural Tourism	3		3		
	MRT/MJ/603-T	ICT in Rural Technology	2		2		
	MRT/MJ/604-P	Lab-I: Watershed Management – II		2		1	
	MRT/MJ/605-P	Lab-II: Food Processing Technology-II		2		1	
	MRT/MJ/606-P	Lab-III: Rural Tourism		2		1	
DSE (Choose any one from pool of courses)	MRT/DSE/607-T	Organic Farming	3		3		04
	MRT/DSE/608-P	Lab-IV: Organic Farming		2		1	
	or	or					
	MRT/DSE/609-T	Medicinal and Aromatic Plants	3		3		
	MRT/DSE/610-P	Lab-IV: Medicinal and Aromatic Plants		2		1	
	or	or					
	MRT/DSE/611-T	Environment & Disaster Management	3		3		
	MRT/DSE/612-P	Lab-IV: Environment & Disaster Management		2		1	
RP-I	MRT/RP-I/649-P	Research Project-I		8		4	04
			14	16	14	08	22 Credits

AS PER NEP 2020

Illustrative Credit distribution structure for Two Years Master's Degree Programme with Multiple Entry and Exit options –

Class: M. Sc. First Year Semester: IV Subject: Rural Technology

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory DSC	MRT/MJ/650-T	Agricultural Biotechnology	3		3		14
	MRT/MJ/651-T	Biomass Management & Utilization	3		3		
	MRT/MJ/652-T	Apiculture	3		3		
	MRT/MJ/653-P	Lab-I: Agricultural Biotechnology		2		1	
	MRT/MJ/654-P	Lab-II: Biomass Management & Utilization		2		1	
	MRT/MJ/655-P	Lab-III: Apiculture		2		1	
DSE (Choose any one from pool of courses)	MRT/DSE/656-T	Farm Machine and Power	3		3		04
	MRT/DSE/657-P	Lab-IV: Farm Machine and Power		2		1	
	or	**or**					
	MRT/DSE/658-T	Power System for Renewable Energy Sources	3		3		
	MRT/DSE/659-P	Lab-IV: Power System for Renewable Energy Sources		2		1	
	or	**or**					
	MRT/DSE/660-T	Mushroom Cultivation Techniques	3		3		
	MRT/DSE/661-P	Lab-IV: Mushroom Cultivation Techniques		2		1	
RP-II	MRT/RP-II/699-P	Research Project-II		12		6	04
			12	**20**	**12**	**10**	**22 Credits**

14. Curriculum For Semester – I

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- I)

Course Code No.: MRT/MJ/500-T	**No. of Credits: 03**	**Hours: 45**
Course Title	**Natural Rural Resources**	

Learning Objectives:

1. To understand the nature and characteristics of rural resource and its importance in Rural Development.
2. To understand various resources available in rural India such as land, water and human and other Resources.
3. To get acquainted with Government initiatives and participation related to rural resources.

Unit	Course Content	Periods
I	**Nature and Characteristics of Rural Resources** Definition and meaning of Resources, Types of Rural Resources, Natural and Man-made, Characteristics of Resources, Importance of different resources in Rural Development.	09
II	**Land Resources** Classification of land based on utility, Soils – Structure and importance, Properties of Soil- Physical and Chemical, Soil Conservation- methods and importance, Rock and ores – Minor mineral produce in rural areas of Konkan, Land degradation in rural areas – causes and remedies.	09
III	**Water resource** Factors controlling availability of water in rural areas- Seasonality of rainfall, rock type, vegetative cover, Source of water and their characteristics – Sub-Surface- Deep and Shallow and Surface, Water conservation and management- Watershed development, rain water harvesting, advanced irrigation, Ground water recharge, Problems and issues in rural water scenario- Contamination, Distribution, Priority of Use.	09
IV	**Living Resources** Vegetation – Types of uses, Importance as resource- Timber, fuel, construction, agricultural, plantation, raw material, Forest rights and Joint Forest management, Wide life- Diversity of life, it's role in ecology, resources potential, Nature of conflict between wide life and Farmers in Konkan. **Human Resources** Quantitative aspects of rural human resource – Gender & Age wide classification, Density, Issue in rural human resources- Scarcity, lack of skill, attitude and social status.	09
V	Government initiatives and participation of various Stake holders for development and Protection of Rural resources.	09

Learning Outcomes

1. The students will understand various natural resources and their importance in rural development.
2. The students will get exposure to various challenges and problems with regard to availability and use of natural resources.
3. Students will demonstrate effective application of solve problems of rural resources and perform relevant activities

Suggested Readings

1. Rural Development: Principles, Policies and Management, Katar Singh, Sage Publications India Pvt. Ltd., 2009.
2. Development of Land Resources – E-book on Activities Department of Land Resources, Ministry of Rural Development, Government of India, Dec. 2014,
3. http://dolr.nic.in/downloads/PDFs/DoLR%20Activities.pdf

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- II)

Course Code No.: MRT/MJ/501-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Crop Production Technology**	

Learning Objectives

1. To prepares students to operate enterprises related to crop production
2. To make students aware of technology in producing cereal grain, fibre, forage, oilseed, tree fruits and nuts, etc.
3. To get acquainted with crop cultivation practices, plant diseases, pest management, harvesting and marketing.

Unit	Course Content	Periods
I	Classification of crops; Effect of different weather parameters on crop growth and development; Principles of tillage; Soil-water-plant relationship , crop rotation, cropping systems, relay cropping and mixed cropping; Crop production technology for **major cereal crops** viz., paddy, wheat, maize, pearl millet, sorghum, etc.; Major varieties, sowing time, method of sowing, spacing, inter culturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.;	09
II	Crop production technology for **major oilseed crops** viz., groundnut, sesame, rapeseed, mustard, castor, etc.: Major varieties, sowing time, method of sowing, spacing, inter-culturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.; Crop production technology **for major pulse crops** viz., pigeon pea, cowpea, gram, green gram, black gram, etc.: Major varieties, sowing time, method of sowing, spacing, inter-culturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.;	09
III	Crop production technology for **major spices and cash crops** viz., cumin, coriander, funnel, ginger, garlic, sugarcane, etc.: Major varieties, sowing time, method of sowing, spacing, inter-culturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.; **forage crops**-sorghum, cowpea, cluster bean and napier. Forage crops-berseem, lucerne and oat. **medicinal and aromatic crops**-mentha, lemon grass and citronella,	09
IV	**Horticulture:** Scope of horticultural crops. Soil and climatic requirements for fruits and vegetables, nursery raising and management; Crop production technology **for major fruit crops** viz., mango, banana, sapota, aonla, pomegranate, guava, etc.: Major varieties, time of transplanting, spacing, inter-culturing, fertilizer and water requirement, time and method of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.;	09
V	Crop production technology for **major vegetable crops** viz., potato, onion, tomato, chilli and other green and leafy vegetables: Major varieties, sowing time, method of sowing, spacing, inter culturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc	09

Learning Outcomes:

1. Students will demonstrate knowledge of scientific principles related to agriculture.
2. Students will demonstrate knowledge of agricultural industries including structure, production practices, and management principles.
3. Students will demonstrate effective application of agricultural knowledge and resources to solve problems and perform relevant activities.

Suggested Reading

1. Prasad and U. Kumar. 2010. Principles of Horticulture. Agrobios, New Delhi.
2. Yellamanda Reddy and G.H. Shankar Reddy. 1995. Principles of Agronomy. Kalyani Publishers, Ludhiana.
3. S.S. Singh., Principles and Practices of Agronomy. 1985. Kalyani Publishers, Ludhiana

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- III)

Course Code No.: MRT/MJ/502-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Irrigation Technology**	

Learning Objectives

1. To familiarize students with concepts and fundamentals of agricultural production system
2. To enable students, thorough understand soil-water plant relationships
3. To give students comprehensive knowledge of crop water requirement and its estimations

Unit	**Course Content**	**Periods**
I	Measurement of Land, i.e. size, shape, Calculation formulae, Land shaping, Levelling, grading, Measurement of slope & its methods.	09
II	Measurement of water storage, flows and instruments used, Application methods for different types of crops, Furrows, Basin, Raised beds, Borders.	09
III	Different crops; Horticulture, sericulture, cereals, Pules, cash crops, their stages, crop water requirements, formulae, Evapotranspiration of crops.	09
IV	Pressurized irrigation systems, types, Sprinkler irrigation – parts, functioning, Layouts, Evaluation Maintenance & Repairing, Government facilities.	09
V	Drip irrigation – Parts, layout, functioning, Evaluation, Government. Facilities, underground systems & miscellaneous.	09

Learning Outcomes:

1. Acquire knowledge of irrigation water
2. Use of irrigation water in farm lands
3. Understand different irrigation methods

Suggested Readings

1. "Drainage Engineering" by J. N. Luthin, 1st edition, 2021
2. "Irrigation -Theory and Practice" by A.M. Michael, 2nd edition, 1978
3. "Irrigation Engineering" by Gurcharan Singh, 2nd edition, 2010
4. "Irrigation And Drainage" by D. Lenka, 2013
5. "Irrigation and Drainage Engineering" by Peter Waller and MulunehYitayew Volume 1st 2002

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- IV)

Course Code No.: MRT/MJ/503-P	**No. of Credits: 01**	**Hours: 30**
Course Title	**Lab-I - Natural Rural Resources**	

Learning Objectives:

1. To understand the nature and characteristics of rural resource and its importance in Rural Development.
2. To understand various resources available in rural India such as land, water and human and other Resources.
3. To get acquainted with Government initiatives and participation related to rural resources.

Unit	**Course Content**	**Periods**
I	1) To Study of Nature and Rural Resources 2) To Study of Characteristics of rural resources 3) To Study of Natural and Man- Made Resources for rural development area	06
II	4) To Study of Land Resources and its Importance 5) To Study of soil Properties 6) To Study of different types of rocks available in India (Maharashtra)	06
III	7) To Study of water resources 8) To Study of water erosion and water conservation or its management for rural development area 9) To Study of Irrigation method, issues in rural area and its remedies	06
IV	10) To Study of living resources 11) To Study of forest and its management for precipitation 12) To Study of ecology and role of ecology between wide life and farmers.	06
V	13) To Study of human resources 14) To Study of issue in rural human resources 15) To Study remedies on human resources	06

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- V)

Course Code No.: MRT/MJ/504-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-II - Crop Production Technology**	

Learning Objectives

1. To prepares students to operate enterprises related to crop production.
2. To make students aware of technology in producing cereal grain, fibre, forage, oilseed, tree fruits and nuts, etc.
3. To get acquainted with crop cultivation practices, plant diseases, pest management, harvesting and marketing.

Unit	**Course Content**	**Periods**
I	1) To Study of crops and its Classification 2) To Study of Major Crops. 3) To Study of climate change effect on crop growth	06
II	4) To Study of crop production technology for major oilseed crops 5) To Study of crop production technology for major pulse crops 6) To Study of comparison between oilseed and pulse crops benefits at rural area.	06
III	7) To Study of crop production technology for major spices and cash crops 8) To Study of crop production technology for major Forage crops 9) To Study of crop production technology for major medicinal and aromatic crops	06
IV	10) To Study of Horticulture and its Scope horticulture crops 11) To Study of crop production technology for major Fruit Crops 12) To Study of comparison between horticulture crops of drought area and Irrigated area	06
V	13) To Study of crop production technology for major Vegetable crops 14) To Study of pre planning of vegetable crops in transplanting 15) To Study of issues in vegetable crops and its solution.	06

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- VI)

Course Code No.: MRT/MJ/505-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-III - Irrigation Technology**	

Learning Objectives

1. To familiarize students with concepts and fundamentals of agricultural production system
2. To enable students, thorough understand soil-water plant relationships
3. To give students comprehensive knowledge of crop water requirement and its estimations

Unit	**Course Content**	**Periods**
I	1) To study of measurement of Land 2) To study of surveying and levelling. 3) To study of calculation methods to measurement of different types of land.	06
II	4) To study of Water storage measurement. 5) To study of water application methods of crops. 6) To study of comparison between method of water application.	06
III	7) To study of water requirements of different crops. 8) To study of formulate on calculating of water requirement of crops. 9) To study of transpiration and evapotranspiration of crops.	06
IV	10) To study of pressurized irrigation system. 11) To study of sprinkler irrigation system. 12) To study of layout of sprinkler irrigation system.	06
V	13) To study of drip irrigation system. 14) To study of layout of drip irrigation system. 15) To study of comparison between inline and outline drip irrigation system.	06

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(MANDATORY SUBJECT- VII)

Course Code No.: MRT/MJ/506-P	**No. of Credits: 02**	**Hours: 60**
Course Title:	**Indigenous Technical Knowledge System**	

Learning Objectives

1. To facilitate the students with the concepts of Indian traditional knowledge
2. To make them understand the Importance of roots of knowledge system.
3. To illustrate the significance of Traditional and Modern knowledge system

Unit	**Course Content**	**Periods**
I	1) To Study of the concept of traditional, indigenous, western and formal knowledge 2) To Study of characteristics and scope of traditional, indigenous, western and formal knowledge 3) To Study of historical impact of social change on indigenous, western and formal knowledge	12
II	4) To Study of the need and importance of protecting traditional knowledge. 5) To Study of the value of traditional knowledge in the global economy 6) To Study of role of government to harness of traditional knowledge.	12
III	7) To Study of various enactments related to the protection of traditional knowledge 8) To Study of the legal frame work traditional knowledge. 9) To Study of The Recognition of Forest Rights, PPVFR Act, Biological Diversity Act 2002/2004, Geographical indications act 2003, the protection of traditional knowledge bill, 2016.	12
IV	10) To Study of concepts of Intellectual property Rights to protection of the traditional knowledge 11) To Study of Strategies to increase protection of traditional knowledge 12) To Study of the global legal FORA for increasing protection of Indian traditional knowledge	12
V	13) To Study of the traditional knowledge in different sectors. 14) To Study of traditional knowledge importance in conservation and sustainable development of environment 15) To Study of Food security of the country and protection of traditional knowledge	12

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(ELECTIVE SUBJECT- I)

Course Code: No: MRT/DSE/507-T	No. of Credits: 03	Hours: 45
Course Title:	**Fundamentals of Biodiversity and Conservation**	

Learning Objectives

1. To extend the importance of interactions among the species
2. To demonstrate the importance of maintains, conservation of ecosystem
3. To illustrate the significance of conservation of agricultural biodiversity

Unit	Course Content	Periods
I	**Biodiversity** Concept, definition and type of biodiversity, biodiversity at global, country and local level, evolution of biodiversity, factor promoting high diversity, Endemism and hotspots of biodiversity, India as mega biodiversity nation, wealth of Indian hot spots, monitoring and measures of biodiversity.	09
II	**Values of Biodiversity** 2.1. Utilitarian value and their categories, direct use value; indirect/ Non-consumptive use value. 2.2.Ecological Economics; Monetizing the value of Biodiversity; Intrinsic Value; Ethical and aesthetic values, Anthropocentrism, Biocentrism, Ecocentrism and Religions; Intellectual Value; 2.3.Biodiversity and sustainable development	09
III	**Threats to Biodiversity** 3.1. Habitat destruction, fragmentation, transformation, degradation and Loss: Causes, Patterns and consequences on the Biodiversity of Major Land and Aquatic Systems **3.2. Impact of human development on biodiversity** **Invasive species:** their introduction pathways, biological impacts of invasive species on terrestrial and aquatic systems **3.3. Effect of pollution on biodiversity**: Impacts of pesticide pollution, water pollution and air pollution on biodiversity **Overexploitation:** Impacts of exploitation on target and non-target terrestrial and aquatic species and ecosystems **Extinction:** Types of extinctions, processes responsible for species extinction, current and future extinction rates, IUCN threatened categories, sixth extinction/biological crisis	09
IV	**Conservation Planning and Climate Change** The Bioclimatic Envelope Model for individual species; Climate Change -Integrated strategies for Conservation; Predictions on future responses of ongoing Climate Change on Biodiversity, Potential Adaptation Options and their consequences on Ecosystems and Biodiversity, REDD+, Synergies between Sustainable Use of Biodiversity and Climate Change	09
V	**Conservation of Agricultural Biodiversity** 5.1. Conserving species of Economic significance 5.2. Significance of gene banks and germ plasm conservation 5.3. Use of wild species for producing improved hybrid varieties 5.4. Seed Banks & Artificial seeds in conservation 5.5. Conservation of Live Stock species /varieties 5.6. Alternate species for future food securities (examples); Job's tear plant (Coixlacrymajobi) Indian wild buffalo (Bubalusarnee) Mithun (Bos frontalis). Hybrids between wild and domestic species (e.g. Mithun) Conservation of economically important aquatic species	09

Learning Outcomes

1. To understand different type of ecosystem services and provide examples of ultimate and proximate threats to biodiversity and ecosystem integrity.
2. To understand that ecological processes are essential for maintaining biodiversity and ecosystem integrity.
3. To understand the habitat loss and fragmentation and their impacts on biodiversity and ecosystem integrity

Suggested Readings:

1. Groom, M. J., Meffe, G. R. and C. R. Carroll. Principles of Conservation Biology. Sinauer Associates, Inc., USA. 2006
2. Krishnamurthy, K. V. Textbook of Biodiversity, Science Publication. 2003
3. Primack, R. Essentials of Conservation Biology.Sinauer Associates, Inc., USA. 2006
4. Hambler, C. Conservation. Cambridge University Press. 2004
5. Van Dyke, F.Conservation Biology Foundations, Concepts, Applications 2nd Edition, Springer. 2008

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(ELECTIVE SUBJECT- II)

Course Code No.: MRT/DSE/508-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-IV - Fundamentals of Biodiversity and Conservation**	

Learning Objectives

1. To extend the importance of interactions among the species
2. To demonstrate the importance of maintains, conservation of ecosystem
3. To illustrate the significance of conservation of agricultural biodiversity

Unit	**Course Content**	**Periods**
I	1) To Study of Biodiversity and its types 2) To Study of ultimate and proximate threats to biodiversity 3) To Study of evolution of biodiversity and wealth of Indian hot spots	06
II	4) To Study of values of biodiversity 5) To Study of Ecological Economics 6) To Study of biodiversity and sustainable development	06
III	7) To Study of threats to biodiversity 8) To Study of impact of human development on biodiversity 9) To Study of effect of pollution on biodiversity	06
IV	10) To Study of conservation planning and climate change 11) To Study of integrated strategies for conservation 12) To Study of REDD+, Synergies between sustainable use of biodiversity and climate change	06
V	13) To Study of conservation of agriculture biodiversity 14) To Study of significance of seed bank and artificial seeds in conservation 15) To Study of conservation of livestock species/verities	06

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(ELECTIVE SUBJECT- III)

Course Code No.: MRT/DSE/509-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Watershed Management – I**	

Learning Objectives

1. To understand different watershed behaviour
2. To be able to interpret runoff data and quantify erosion by using various modelling Methods.
3. To understand land use classification and impact of land use changes on hydrological cycle Parameters

Unit	Course Content	Periods
I	**Introduction to Basic Concept** Concept of watershed, History & present status of development, different stake holders & their importance, community participation, Gram Sabha, gram samiti, policies & decision making, role of govt in watershed Management, NGOS in watershed Management, Private Sector participation, Self-help groups case studies. (Theoretical & analytical)	09
II	**Natural Resources** Units of Measurement of water & land, Needs & availability in watershed, size & shape of watershed, Norms of Government, Qualities & standards for human being & agriculture, (Theoretical & analytical)	09
III	**Soil & Water Conservation –** Erosion & their types, soil & water conservation, treatments, drainage line treatments, gully plugs, brushwood dams, Vanaraibandhara, loose boulder dams, gabianbandhara, underground bandhara earthen nalla bund, cement nalla bund, Kadia pattern, shirpur pattern, (Theoretical & analytical)	09
IV	**Treatment on land –** Tree plantation, grasses, contour trenches, compartment bunding, land levelling, grading, smoothening, farm ponds, recharging of wells bores, Mapping, Scales, Symbols, drawings. Land capability & land use planning. (Theoretical & analytical)	09
V	**Climates** Its factors, units, meteorological lab, rainfall, rainfall intensity, rainfall patterns rain gauges, evaporation, Evaporimeter, wind, anemometer, humidity, dry & wet bulb thermometer, sunshine, sunshine recorder, water budgeting. Steps in watershed management. (Theoretical & analytical)	09

Learning Outcomes

1. Suggest technical measures for soil erosion control both due to water and wind
2. Assess the current status of the watershed at field, by taking up accurate investigation measures and conduct survey
3. Suggest drought control measures, water conservation structures, including design

Suggested Readings

1. The Rain water Technology Handbook: Rain harvesting In Building, Klaus Koenig
2. Soil & Water Conservation & Watershed Management Hardcover – 2012, Singh PK Mahnot
3. Watershed Management (English, Murthy J V S), New age International Publishers Ltd.-New Delhi. 2nd edition., 2017
4. "Hydrology and Water Resources Engineering" by S K Garg Volume 1st 2015
5. "Engineering Hydrology" by K Subramanya, 4th edition, 2017
6. Soil & Water Conservation Engineering by R. Suresh. 2005.

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(ELECTIVE SUBJECT- IV)

Course Code No.: MRT/DSE/510-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-IV - Watershed Management – I**	

Learning Objectives

1. To understand different watershed behaviour
2. To be able to interpret runoff data and quantify erosion by using various modelling Methods
3. To understand land use classification and impact of land use changes on hydrological cycle Parameters

Unit	Course Content	Periods
I	1) To Study of basic concept of watershed management 2) To Study of history and status of development of watershed management 3) To Study of role of government private sector participation, SHG's and NGOS in watershed management	06
II	4) To Study of Units of Measurement of water & land 5) To Study of Needs & availability in watershed 6) To Study of size & shape of watershed	06
III	7) To Study of soil and water erosion 8) To Study of soil and water conservation 9) To Study of different measures for soil and water conservation	06
IV	10) To Study of trenches and bunding 11) To Study of farm pond and recharging of wells bores 12) To Study of land capability and land use planning	06
V	13) To Study of climates related to metrological lab 14) To Study of evaporation and evapotranspiration 15) To Study of instruments of metrological Lab	06

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(ELECTIVE SUBJECT- V)

Course Code No.: MRT/DSE/511-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Animal Husbandry**	

Course Objective :

1. To increase awareness amongst the rural masses regarding improved Animal Husbandry practices.
2. To provide gainful self-employment to the weaker sections of the society in livestock sector.
3. To create and maintain a "Disease Free Status" of major production areas so as to boost export of livestock products

Unit	Course Content	Periods
I	Place of livestock in the national economy, different livestock development programmers of govt. of India. Important exotic and Indian breeds of cattle, buffalo, sheep & goat.	09
II	Measures and factors affecting fertility in livestock, reproduction behaviour like estrus, parturition, etc Milk secretion, milking of animals and factors affection milk yield and composition.	09
III	Selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing heifers and milk animals & other classes of animal.	09
IV	Different type of animal housing principles space requirement for different species of livestock. Disease control measures sanitation and care breeding and production records.	09
V	Introduction of poultry house, Buffalo, sheep, goat. Prevention of diseases, Preservation and marketing of eggs it's economics and keeping quality cost of production of milk, economical units of cattle, buffalo, sheep & goat.	09

Learning Outcomes:

1. To determine and know the standards of care for animals in a colony setting.
2. To use safe handling techniques and aids for moving and restraining healthy cats and dogs.
3. To observe & document typical behaviours, attitudes and health indicators of cats and dogs.

Suggested Readings:

1. A Textbook of Animal Husbandry by G C Banerjee. 8th edition 2019
2. Advanced Animal Nutrition by D. V. Reddy 1st edition 2020
3. Agricultural Economics by S. Subba Reddy 2nd edition 2019
4. Animal Husbandry by Gyan Deep Singh, Anmol Publishers, 2008
5. Animal Physiology by K. A. Goyal, Rastogi Publishing, 2003
6. Animal Physiology by Kavita Juneja, Anmol Publishers 2002
7. Biotech's Dictionary of Animal Husbandry by L.L. Somani Daya Publishing, Volume 2nd
8. Biotechnology Expanding Horizons by B D Singh, Kalyani Publishers, 2020

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(ELECTIVE SUBJECT- VI)

Course Code : MRT/DSE/512-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-IV - Animal Husbandry**	

Course Objective :

1. To increase awareness amongst the rural masses regarding improved Animal Husbandry practices
2. To provide gainful self-employment to the weaker sections of the society in livestock sector
3. To create and maintain a "Disease Free Status" of major production areas so as to boost export of livestock products

Unit	**Course Content**	**Periods**
I	1) To Study of Place of livestock in the national economy 2) To Study of different livestock development programmers of govt. of India. 3) To Study of Important exotic and Indian breeds of cattle, buffalo, sheep & goat.	06
II	4) To Study of Measures and factors affecting fertility in livestock 5) To Study of reproductive system of livestock's 6) To Study of milk method of livestock's	06
III	7) To Study of Selection and breeding of livestock for higher milk and meat production. 8) To Study of Feeding and management of calves 9) To Study of growing heifers and milk animals & other classes of animal.	06
IV	10) To Study of animal housing principles space requirement for different species of livestock. 11) To Study of different disease of livestock's 12) To Study of disease control measures sanitation and care breeding	06
V	13) To Study of poultry Farm 14) To Study of Buffalo Farm 15) To Study of sheep and goat farm	06

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(RESARCH METHODOLOGY)

Course Code No.: MRT/DSE/513-T	No. of Credits: 04	Hours: 60
Course Title:	**Research Methodology**	

Learning Objectives

1. Student will know the different research approaches, scientific methods, criteria for good research and innovation.
2. Student will get knowledge of problems encountered while working on research plan, Field and laboratory research problems.
3. Students can design the research project with the help of review of produced results, techniques of interpretation, published literature and proper layout of research report

Unit	Course Content	Periods
I	Definition of research, Objectives of research, Research approaches, Significance of research, Research and scientific methods, Innovation and research, Research process, Criteria of good research, Defining the research problem, Technique involved in defining a problem, Research designs, Developing a perspective research plan.	12
II	Data collection-by survey method and by experimentation. Types of data, Data presentation methods, Data analysis, process of data analysis, Sampling: Populations and samples, Probability and non-probability samples. Simple Random and Stratified sampling.	12
III	Data collection by questioner method, by field visit and by direct observations, Measurements and experimentation, Measures for maintaining accuracy in data.	12
IV	Statistical analysis of data, Determination of mean, Median, mode, Dispersion, standard deviation, Stander errors of data, Correlation study, Significance of studies and Regression analysis of data.	12
V	Interpretation of data, Interpretation of produced results, Techniques of interpretation, Conclusion of research work, Reviewing of produced results/ output/data with the help of published literature, Scientific output as scientific principle or literature, Report writing, Steps in writing report, Layout of research report , Types of reports, review article writing.	12

Learning Outcomes

1. Explain the different research approaches, scientific methods, criteria for good researches.
2. Design the research project with the help of review of produced research, techniques of interpretation, published literature and proper layout of research.
3. Acquire knowledge of data collection, presentation of data, data analysis and interpretations.

Suggested Readings

1. Research Methodology-Methods and Techniques, By Kothari C.R. (2011); New Age International Publisher, New Delhi.
2. Research methodology-Text and cases with SPSS applications" by Gupta S.L. and Hitesh Gupta (2011); International book house Pvt. Ltd, New Delhi.
3. "Statistical Methods" by S. P. Gupta, Publisher S. Chand and Sons.
4. "Fundamentals of Research methodology and statistics" by Yogesh Kumar Singh, New Age International Publication, New Delhi.
5. "How SAGE has shaped Research methods A 40 years history" by John W Cresewell, University of Nebraska. Lincoln.
6. "The Essence of Research Methodology, by Jan Jonker & Bartjan Pennink, Springer.

15. Curriculum for Semester – II

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- I)

Course Code No.: MRT/MJ/550-T	No. of Credits: 03	Hours: 45
Course Title	**Commercial Plant Breeding**	

Learning Objectives:

1. To understand the Plant Breeding and its importance in Rural Development.
2. To understand the various commercial plant breeding methods.
3. To make students aware Techniques of Seed Production.

Unit	Course Content	Periods
I	**Plant Reproduction** Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross-pollinated crops (A/B/R and two-line system) for the development of hybrids and seed production.	09
II	**Genetic Purity Test** Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc.	09
III	**Quality Seed Production** Quality Seed production of vegetable crops under an open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.	09
IV	**IPR Issues In Commercial Plant Breeding** DUS testing and registration of varieties under PPV&FR Act. Variety testing, release and notification systems in India.	09
V	**Techniques Of Seed Production** Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.	09

Learning Outcomes

1. The students will understand the Plant Breeding and its importance in Rural Development.
2. The students will get exposure to various challenges and problems with regard to availability and use of plant breeding.
3. The Students will demonstrate techniques of seed production perform relevant activities.

Suggested Readings:

1. Hybrid Seed Production in Field Crops: Principles and Practices by N. C. Singhal, 2003, a. Kalyani publication, Delhi.
2. Principles of Seed Technology by P.K. Agrawal, 2002, Oxford.
3. Seed Production of Vegetables. By Prabhakar Singh and B. S. Asati.
4. Seed Technology, R. L. Agarwal 1996, Oxford.
5. Plant Breeding; Principles and Methods by B.D. Singh, 2006, Kalyani publication, Delhi
6. Genetics by P. K. Gupta, 2002 Rastogi publication.
7. Seed Technology by Dhirendra Khare and Mohan S. B. Bhale, 2005
8. Principles and practices of plant breeding by Sharma J. R.1984, Tata Mc Graw –Hill.
9. Practical plant breeding by S. K. Gupta 2004, Agribios publication
10. Fundamentals of Plant Breeding & hybrid seed production, by R. L. Agarwal, 1996, Oxford.

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(MANDATORY SUBJECT- II)

Course Code No.: MRT/MJ/551-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Food Processing Technology-I**	

Learning Objectives

1. To prepares students to operate food processing related to some fruit
2. To make students aware of food technology in producing cereal grain, fibre, forage, oilseed, fruits and etc.
3. To learn and understand the basic principles and various methods of food preservation.

Unit	Course Content	Periods
I	**Food and Nutrition** Definition of nutrient, nutrition, food, factors affecting human nutrition, functions of food, Classification of food, food groups, food guide pyramid, nutrient wheel definitions, functions, deficiency symptoms and excessive consumption consequences of micronutrients, water, dietary fiber	09
II	**Food Processing Technologies** Concept – steps and Principles - methods of preservation – important commercial methods like - Canning, preparation of Jam, Jelly, Pickles, Squash, Marmalade, etc.	09
III	**Post-harvest Technology** Role of agro processing in rural development- Scope and importance, Post-harvest Technology – Concept- Importance with reference to agricultural products – Present scenario with reference to World, India, Maharashtra and Marathwada– Scope - extent of Post-harvest losses–causes of Post-harvest losses –salient features of Post-harvest Management.	09
IV	**Post-harvest technology of major crops** Post-harvest technology and product diversification aspect of important crops like Sugarcane-Jaggery production, utilization of molasses, Cereals –Rice; Fruits–Mango, banana, sapota, guava, Lemon; Spices–Ginger, Pepper, Turmeric; Plantation crops - Coconut, Commercial Flowers, etc.	09
V	**Entrepreneurship Development in Food processing Industries** Scope of self – employability – Present scenario - licensing and FSSAI registration aspects - list of machineries used in processing Industry - marketing strategies.	09

Learning Outcomes:

1. Students will demonstrate knowledge of agricultural food industries including structure, production practices, and management principles.
2. Students will demonstrate effective application of food technology knowledge and resources to solve problems and perform relevant activities.
3. The students will get exposure to different technologies of food processing and will have hands on experience of preparation of various processed products.

Suggested Reading

1. Handbooks of vegetable Science and Technology: Production, Composition, Storage and Processing by D. K. Salunkhe, S.S. Kadam, 1st edition, 1995.
2. Post-harvest Technology by S. Krishnaprabhu, 2020
3. Post-harvest Technology of Fruit and Vegetables by A. K. Thompson, 2nd edition, 2003
4. Post-harvest Technology of Fruit and Vegetables by K. Prasad, 1st edition, 2021
5. Post-harvest Management and Processing of Fruit and Vegetables by N.S. Rathore, G.K. Mathur, ICAR New Delhi.
6. Food Science by Norman N. Pottter, Joseph H. Hotchkiss 5th edition, 2007
7. Food Processing Technology: Principle and Practice P.J. Fellows 4th edition, 2017

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(MANDATORY SUBJECT- III)

Course Code No.: MRT/MJ/552-T	No. of Credits: 03	Hours: 45
Course Title:	**Drying of Farm Crops**	

Learning Objectives

1. To familiarize students with concepts and fundamentals of drying and storage system
2. To enable students to apply basic concepts of drying and storage in real life situations.
3. To give students comprehensive knowledge of Solar dryer and modern storage structures its estimations.

Unit	Course Content	Periods
I	**Moisture Content** Moisture content and methods for determination, importance of EMC and methods of its determination, EMC curve and EMC model, principle of drying, theory of diffusion, mechanism of drying- falling rate, constant rate, thin layer, deep bed and their analysis, critical moisture content, drying models.	09
II	**Introduction of Drying** calculation of drying air temperature and air flow rate, air pressure within the grain bed, Shred's and Hukill's curve, different methods of drying including puff drying, foam mat drying, freeze drying, etc. Study of different types of dryers- performance, energy utilization pattern and efficiency, study of drying and dehydration of agricultural products.	09
III	**Introduction of Storage Structures** Study of different types of storage structures and causes of spoilage in storage, conditions for storage of perishable products, functional requirements of storage, control of temperature and relative humidity's inside storage, calculation of refrigeration load; modified atmospheric storage and control of its environment, air movement inside the storage, storage of grains	09
IV	**Mechanism of Storage Structures** Destructive agents, respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through natural ventilation, mechanical ventilation, artificial drying, grain storage structures such as Bukhari, Morai, Kothar, silo, CAP, warehouse - design and control of environment.	09
V	**Environmentally effect on stored grains** Storage of cereal grains and their products, storage of seeds, hermetically sealed and air-cooled storages-refrigerated, controlled atmosphere, modified atmospheric and frozen storages. Storage condition for various fruits and vegetables under cold and CA storage system. Economic, aspects of storage.	09

Learning Outcomes:

1. To acquire knowledge of about drying and storage of farm crops.
2. To use of drying and Storage methods in rural area.
3. To understand different drying and storage techniques for agricultural products.

Suggested Reading

1. A. S. Mujumdar, "Drying Technology in Agriculture and Food Science", Oxford and IBH Publishing House, 2000.
2. K. M. Sahay and K. K. Singh, "Unit Operations of Agricultural Processing", 2 nd edition, Vikas Publishing House, New Delhi, 2004
3. J. L. Multon, "Preservation and Storage of Grains, Seeds and their By-products: Cereals, Oil Seeds, Pulses and Animal Feed". 1 st edition, CBS Publishing and Distributions, Delhi, 1989.
4. S. Vijayaraghavan, "Grain Storage Engineering and Technology", 1 st edition, Batra Book Service, New Delhi, 1993.
5. W. L. McCab and J. C. Smith, "Unit Operation in Chemical Engineering", 7 th edition, McGraw Hill, Tokyo, 2005.

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(MANDATORY SUBJECT- IV)

Course Code No.: MRT/MJ/553-T	No. of Credits: 02	Hours: 30
Course Title:	**Rural Health Management**	

Learning Objectives

1. The core objectives of rural health science are to inform people, Build public opinion, Persuade, circulate government health policies, Disseminate health and education programmes, Help in facing epidemics, Highlight role and promote public health.
2. Bring awareness among the students about the dynamics of rural hearth.
3. Develop community based health learning for communicating rurally relevant health messages.

Unit	Course Content	Periods
I	**Introduction to health education:** concepts, objectives, philosophy, importance and need of health education in public health. Definition of Health education principles of hearth education. The role of the health education specialist in relation to other health personnel. Role of health education in the process of social change.	06
II	**National Health Programmes and eradication programmes:** National Malaria Eradication programme. Iodine deficiency disorders control programme. National programme for control of Blindness. National water supply and sanitation programme. National family welfare programme. Universal immunization programme. National STD /AIDS control programme. National Rural Health Mission, MDGs and pulse Polio Immunization.	06
III	**Health Programme Policies and Programmes:** Introduction: Basic concepts of occupational health and its components. Environment and industry: temperature, humidity, air movement and Radiation. Industrial toxicology. Occupational diseases Measures for control of industrial health disorders. Health hazards in agriculture. Preventive measures and role of health education in occupational health.	06
IV	**Environmental health and Environmental sanitation:** Components of environment man and his environment. Community sanitary survey (group assignment) problems in relation to water - sewage, refuse, air, food, housing and public places. Environment and Health: Need for improvement of environment, concepts of Environment. Environmental sanitation in the National plans: National schemes for Improvement of environment.	06
V	**Health survey and development reports:** History of health services in India. National plans: Planning commission and Five year plans: Interdependence in health, international health regulations - scope, objectives and functioning. WHO: constitution, objectives, plans of operation: assistance. UNICEF: constitution, objectives, functions, roles, various programmes. Other agencies like USAID.	06

Learning Outcomes:

1. After completion of the course the student will be able to address the challenges with suitable responses for the identified rural health issues engage in the management of the rural health.
2. Student will be Help to identify and accordingly respond to community health needs.
3. Student will be give insights of broader health issues and its impact on the rural health.

Suggested Reading

1. Annual Report 2001-2002, the Ministry of Health and Family Welfare, the Government of India, New Delhi.
2. Major Schemes and Programmes, 2000 (Nov.): The Ministry of Health and Family Welfare, the Government of India, New Delhi.
3. Parks Text Book of Preventive & Social Medicine, 1999 K.Park, Banarsidas Bhanot Publishers, Jabalpur.
4. Health for All –An Alternative Strategy, 1981: The Indian Council of Social Science Research & ICMR, New Delhi.
5. Banerjee, D., 1985: Health & Family Planning Services in India: The Epidemiological, Socio-cultural & Political Analysis and a Perspective , Lokprakashan, New Delhi
6. Rajaram, Bharathi and Narayanarao, Suresh and Hegde, Sukanya, Rural Healthcare Management (February 1, 2016). Partha S. Mukherjee (Dec. 30 2023) Understanding Public Health in Rural Populations of India.
7. Bill Auxier PhD, Nikki King, Tim Putnam (Aug 31 2023) Healthcare Leadership and Rural Communities Challenges, Strategies, and Solutions.

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(MANDATORY SUBJECT- V)

Course Code No.: MRT/MJ/554-P	**No. of Credits: 01**	**Hours: 30**
Course Title	**Lab-I: Commercial Plant Breeding**	

Learning Objectives:

1. To understand the Plant Breeding and its importance in Rural Development.
2. To understand the various commercial plant breeding methods.
3. To make students aware Techniques of Seed Production.

Unit	**Course Content**	**Periods**
I	1) To Study of Floral Biology in self-pollinated species 2) To Study of Floral Biology in cross pollinated species. 3) To Study of learning techniques in hybrid seed production using male-sterility in fields crops.	06
II	4) To Study of concept of rouging in seed production plot 5) To Study of concept of line, its multiplication and purification in hybrid seed production 6) To Study of pollinators in hybrid seed production	06
III	7) To Study of Sampling and analytical procedures for purity testing and detection of spurious seed 8) To Study of private seed production and processing plants 9) To Study of Techniques of seed production using two line systems in self and cross pollinated crops.	06
IV	10) To Study of Problems in hybrid seed production. 11) To Study of tools and Techniques for optimizing hybrid seed production. 12) To Study of Seed sampling.	06
V	13) To Study of Physical purity test and detection of spurious seed. 14) To Study of IPR issue in commercial plant breeding 15) To Study Economics of commercial seed production.	06

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(MANDATORY SUBJECT- VI)

Course Code No.: MRT/MJ/555-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-II: Food Processing Technology-I**	

Learning Objectives

1. To prepares students to operate enterprises related to crop production
2. To make students aware of technology in producing cereal grain, fibre, forage, oilseed, tree fruits and etc.
3. To get acquainted with crop cultivation practices, plant diseases, pest management, harvesting and marketing.

Unit	**Course Content**	**Periods**
I	1) To Study of agro processing in rural development 2) To Study of Post-harvest Technology. 3) To Study of Present scenario with reference to World, India, Maharashtra and Marathwada– Scope - extent of Post-harvest losses–causes of Post-harvest losses – salient features of Post-harvest Management	06
II	4) To Study of Steps in Post-harvest handling–Harvesting stages–maturity indices of fruits. 5) To Study of Steps in Post-harvest handling–Harvesting stages–maturity indices of vegetables, Sorting and Grading-Precooling, Pre-treatments 6) To Study of Pre-treatments- Importance of packing–Types of Packages used for packing of Commercial products- Methods of storage– transportation.	06
III	7) To Study of Post-harvest technology. 8) To Study of product diversification aspect of important crops like Sugarcane-Jaggery production, utilization of molasses, Cereals –Rice. 9) To Study of product diversification aspect of important Fruits like- Mango, banana, sapota, guava, Lemon; Spices–Ginger, Pepper, Turmeric; Plantation crops - Coconut, Commercial Flowers, etc	06
IV	10) To Study of food processing technology 11) To Study of Concept – steps and principles of food processing technology 12) To Study of important commercial food processing methods like - Canning, preparation of Jam, Jelly, Pickles, Squash, Marmalade, etc.	06
V	13) To Study of Entrepreneurship Development in Agri - based processing Industries. 14) To Study of Scope of self – employability – Present scenario – licensing. 15) To Study of FSSAI registration aspects - list of machineries used in processing Industry - marketing strategies.	06

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(MANDATORY SUBJECT- VII)

Course Code No.: MRT/MJ/556-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-III: Drying of Farm Crops**	

Learning Objectives

1. To familiarize students with concepts and fundamentals of drying and storage system.
2. To enable students to apply basic concepts of drying and storage in real life situations.
3. To give students comprehensive knowledge of Solar dryer and modern storage structures its estimations.

Unit	**Course Content**	**Periods**
I	1) To Determination of moisture content of the product. 2) To Study of mechanics of drying of grains. 3) To Study of Sun drying of fruits and vegetables.	06
II	4) To study of Problems using psychrometric chart. 5) To study of Design of Solar dryers. 6) To Design and layout of commercial bag storage facilities.	06
III	7) To Design and layout of commercial bulk storage facilities. 8) To Design and layout of commercial Morai storage facilities. 9) To Design and layout of commercial Bukhari storage facilities.	06
IV	10) To Design and layout of commercial Pusa bin storage facilities. 11) To study of Determination of EMC and ERH. 12) To study the effect of relative humidity and temperature on grains stored in gunny bags.	06
V	13) To Study of comparison between drying and dehydration. 14) To study of comparison between traditional and modern drying methods/storage structures. 15) To study of Visits to commercial handling and storage facilities for grains.	06

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(ELECTIVE SUBJECT- I)

Course Code: No: MRT/DSE/557-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Green House Technology**	

Learning Objectives

1. To develop the broad, general understanding of the agricultural industry and the role it plays in today's world as well as look more specifically at the role of ornamental horticulture and the greenhouse industry
2. To develop the additional skills.
3. To make students aware of Greenhouse construction and management skill.

Unit	Course Content	Periods
I	**Introduction of Greenhouse Technology** Green house technology- Introduction , Components and design of green houses, Advantages, Applications in agriculture Fundamentals of Green House Technology	09
II	**Layout of Green houses** Structure and Construction of a Green House. Designing and layout of green house, laying the greenhouse	09
III	**Design of greenhouse and Poly house** Installation of greenhouse structure, erection of greenhouse structure Covering the greenhouse with nets and sheets	09
IV	**Maintenance of greenhouse** Checking the first time leakages through the gutter.	09
V	**Production Under Greenhouse Technology** Instruction in greenhouse structures and Greenhouse environment regulations. Plant growth, development and propagation, production and maintenance of bedding and container produced plants.	09

Learning Outcomes

1. The students will get acquainted with greenhouse and poly house technology
2. The Students will acquire the management skills for greenhouse.
3. The Students will comprehend knowledge and skills to get an employment or to become an entrepreneur in greenhouse sector.

Suggested Readings:

1. Greenhouse Technology for Controlled Environment, by G.N. Tiwari, 2009
2. Greenhouse Technology - Management, Operations & Maintenance, by N. N. Patil, 2016
3. Greenhouse Technology & Management by Nicolas Castilla and Esteban Baeza, 2012.
4. Greenhouse Technology & Management by Herna Dez Jose Del Sagrado, 2016
5. Greenhouse management of horticultural crops. 2nd Edition. Agrobios. Prasad S and Kumar U. 2003.

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(ELECTIVE SUBJECT- II)

Course Code No.: MRT/DSE/558-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-IV - Green House Technology**	

Learning Objectives

1. To develop the broad, general understanding of the agricultural industry and the role it plays in today's world as well as look more specifically at the role of ornamental horticulture and the greenhouse industry.
2. To develop the additional skills.
3. To make students aware of Greenhouse construction and management skill.

Unit	**Course Content**	**Periods**
I	1) To Study of Preparation of different media as per need 2) To Study of Calculation of Fertilizer Dosage. Application of fertilizers as per need. 3) To Study of Design and Layout of Greenhouse.	06
II	4) To Study of Installation of Greenhouse Structures. 5) To Study of Maintenance of Greenhouse. 6) To Study of Maintain Health & Safety at the workplace.	06
III	7) To Study of Potential crop for green house 8) To Study of erection of greenhouse structure covering the greenhouse with nets and sheets. 9) To Study of Land survey and levelling for greenhouse.	06
IV	10) To Study of assessment of structural strength, foundation specifications. 11) To Study of Types of glazing material and its characteristics. 12) To Study of Understanding about basic safety checks for greenhouse.	06
V	13) To Study of operation of all machinery and vehicles and hazards for greenhouse. 14) To Study of Instruction in greenhouse structures and Greenhouse environment regulations. 15) To Study of Plant growth, development and propagation for greenhouse.	06

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(ELECTIVE SUBJECT- III)

Course Code No.: MRT/DSE/509-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Nursery Techniques Management**	

Learning Objectives

1. To understand nursery for rural development
2. To be able to interpret grafting by using various propagation methods.
3. To understand layout of nursery and impact on crop growth.

Unit	Course Content	Periods
I	**Introduction about Nursery** Importance, Development. Establishment of Nursery -: Selection of site- Location, Soil and climate for Nursery, Topography, Wind, Elevation of Nursery place, Irrigation and Drainage facilities, Transportation and Marketing facilities, Labour facilities, Situation of Nursery, Free from all types of insects and diseases, Soil and preparation of Nursery.	09
II	**Lay out of Nursery** Bed Department, Construction Department, Water management Department, and Residential Department, Mother plants Department, Roads and Paths Department. Types of Nursery -: Multipurpose or mixed Nurseries, Mono-purpose or General Nursery, Specialized Nursery, Attached or auxiliary or subsidiary nursery.	09
III	**Location of Nursery** Scientific layout of Nursery, Collection of mother plant and their management, Source of available root stocks and their proper utilization, Testing and processing of seeds viability or seeds survival, Use of standard methods of plant propagation, Proper management of seed or storage, Arrangement of good selling, Proper testing facilities, Arrangement of Training and Demonstration, Arrangement of nursery exhibitions.	09
IV	**Nursery Management** Present location of Nursery in India, Suggestions for maximization of Nursery. Plant propagation, Sexual propagation (seed), Asexual propagation – Introduction, Division- suckers, runners, crown, rhizome, corm, tubers, bulb, bulbil, stolen, offset. Rootage- cutting, layering. Graftage- approach grafting, whip, tongue, cleft, saddle, side, veneer, bark, buttressing, epicotyle, bridge, double, Top working, Double working, Frame working.	09
V	**Plant growth regulators** Introduction, Types- Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene. Methods. Green house – Definition, Origin, Preparation, Structure, Types, Advantage. Polly House – Introduction, Structure, Size, Method, Advantage.	09

Learning Outcomes

1. Understand the importance of a plant nursery and basic infrastructure to establish it.
2. Explain the basic material, tools and techniques required for nursery.
3. Demonstrate expertise related to various practices in a nursery.

Suggested Readings

1. Plant Propagation And Nursery Husbandry - G.S. Saini (Hindi & English), 2021
2. A handboob for skill development Nursery Management of horticulture crops. By Deepa H. Dwivedi and Navaldey Bharti 2019.
3. Plant Propagation & Nursery Management by R.R. Sharma & Manish Shrivastav. 2004
4. Plant Propagation and Nursery Husbandry - - Dr. J.V.S. Yadav.
5. Plant Nursery Management: Principles and Practices, Central Arid Zone Research Institute (ICAR), Jodhpur, Rjasthan. Ratha Krishnan, M., et.al. (2014)
6. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. 2. Kumar, N., (1997)
7. Plant Propagation, John Wiley & Sons, New Jersey. Kumar Mishra, K., N.K. Mishra and Satish Chand (1994).

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(ELECTIVE SUBJECT- IV)

Course Code No.: MRT/DSE/560-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-IV - Nursery Techniques Management**	

Learning Objectives

1. To understand nursery for rural development
2. To be able to interpret grafting by using various propagation methods.
3. To understand layout of nursery and impact on crop growth.

Unit	**Course Content**	**Periods**
I	1) To Study of basic concept of Nursery. 2) To Study of sexual propagation in Nursery. 3) To Study of asexual propagation in Nursery.	06
II	4) To Study of Classification of Nursery 5) To Study of Needs & availability in Nursery 6) To Study of Method of Graftage.	06
III	7) To Study of Scientific layout of Nursery. 8) To Study of Plant growth regulators. 9) To Study of different types of Polly House.	06
IV	10) To Study of Mother plants value in Nursery. 11) To Study of BIS (2008) standards related to Nurseries. 12) To Study of Seasonal and routine activities in plant Nurseries.	06
V	13) To Study of tools and Components of good Nurseries. 14) To Study of Common diseases observed in nurseries 15) To Study of role of government private sector participation, SHG's and NGOS in Nursery.	06

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(ELECTIVE SUBJECT- V)

Course Code No.: MRT/DSE/561-T	**No. of Credits: 03**	**Hours: 45**
Course Title:	**Climate Change**	

Course Objective :

1. To increase awareness amongst the Concept of Climatology.
2. To be able to interpret climate change by using various weathering conditions.
3. To create and maintain a "Climate Change Condition" of major production areas so as to boost export of Agriculture Sector.

Unit	Course Content	Periods
I	Concept of Climatology Fundamental principles of climatology, Elements of climate, climate controls, Earth's radiation balance, Spatiotemporal variation of insolation, temperature, pressure, wind belts, humidity, cloud formation and precipitation, global hydrological cycle, water balance.	09
II	Weather and climate, Control of Climate, The Climate System , Climate Anamoly, Variability and change, Koppen's classification of Climate.	09
III	Impact of Climate Change Climate Change since the nineteenth century, Eustatic Changes, and role of oceans and forests as carbon sinks. Effects on organisms including humans; effects on ecosystems and productivity; species responses in terms of distribution ranges, adaptation; spread of diseases; Extinction risk for temperature-sensitive species; UV effects, Global warming and its manifestation on Climate Change, Influence of Extra-terrestrial forces on Climate Change including variation in atmospheric soil and ocean temperature.	09
IV	Climate of India, clouds and precipitation, Possible Global climate Change, Greenhouse effect, Greenhouse gases, stratospheric ozone, Strategies for protecting stratospheric ozone.	09
V	Pollution: definition, causes, effects and control measures of Air pollution, water pollution, soil pollution, Noise pollution, Pollution case studies.	09

Learning Outcomes

1. The students will be able to describe the fundamentals of atmosphere, hydrosphere, lithosphere, pedosphere and biosphere.
2. Present the international climate change legal and policy framework and explain key issues under negotiation.
3. The students will be able to justify the role and responsibility of Indian Industry in climate change.

Suggested Readings

1. Ruddiman W F, Earth's Climate past and Future, W.H. Freeman, 2007
2. Bengtsson F. O., Geosphere Biosphere Interaction and Climate, Cambridge University Press, 2001
3. Berdowski J., Guichert R. and Heil B., The Climate System, A.A. Blakema Publisher, 2000
4. Hardy J. T., Climate Change: Causes, effects and solutions, John Wiley and Sons, 2003
5. Barry, R. G., 2003. Atmosphere, weather and climate. Routledge Press, UK Ellis,
6. Firor, J., & Jacobsen, J. E. 2002. The crowded greenhouse: population, climate change and creating a sustainable world. Yale University Press.
7. Graham, S. 2000. https://earthobservatory.nasa.gov/Features/Milankovitch/ Harvey, D. 2000. Climate and Global Climate Change, Prentice Hall.
8. Huybers, P. and Curry, W. 2006. Links between annual, Milankovitch and continuum temperature variability. Nature, 441: 329
9. Mukherjee, S., Extra-terrestrial Influence on Climate Change, Springer, 2013.
10. Foken, T.; Micrometeorology. Springer-Verlag, Berlin, Heidelberg, 2008.

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(ELECTIVE SUBJECT- VI)

Course Code : MRT/DSE/562-P	**No. of Credits: 01**	**Hours: 30**
Course Title:	**Lab-IV - Climate Change**	

Course Objective :

1. To increase awareness amongst the Concept of Climatology.
2. To be able to interpret climate change by using various weathering conditions.
3. To create and maintain a "Climate Change Condition" of major production areas so as to boost export of Agriculture Sector.

Unit	Course Content	Periods
I	1) To Study of Fundamental principles of climatology. 2) To Study of climate change impacts on agriculture and health. 3) To Study of climate change Impacts on Crops, crop cycles, soil quality and soil organic carbon.	06
II	4) To Study of climate change Impacts on Livestock, fodder production and availability, livestock crisis management. 5) To Study of Impacts on Fisheries, fishing cycles and local community impacts due to change in fishing cycles. 6) To Study of Climate change impacts on forests and transportation	06
III	7) To Study of Climate Change Impacts on Water Cycle. 8) To Study of Uncertainty and climate change policy 9) To Study of Climate change impacts on energy and socioeconomic issues.	06
IV	10) To Study of Climate and Energy Systems and its relevance to various stakeholders in the energy sector. 11) To Study of the effects of climate change on power & heat plants – assessing the risks and opportunities. 12) To Study of Renewable sources, production mechanisms, project planning for Solar PV, wind generation farms.	06
V	13) To Study of Forest biomass for fuel production – potentials, management and risks under warmer climate. 14) To Study of Climate change policy of countries, India and Gujarat. 15) To Study of Policy implications-case studies of successful implementations.	06

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(ON JOB TRAINING)

Course Code : MRT/OJT/FP/563-P	No. of Credits: 04	Course Title: On Job Training
		Hours : 08 Hrs./Week

Course Objective :

1. To increase awareness amongst the concept of rural technology.
2. To be able to interpret on job training ideas using various weathering conditions.
3. To create and maintain a "double income for farmer" of major production areas so as to boost export of Agriculture Sector.

Additional job training ideas tailored for them

1) **Field Research Assistantships:** Partner with local research organizations, NGOs, or governmental agencies to provide students with opportunities to assist in ongoing field research projects related to rural technology. This could involve habitat surveys, technology assessments, or monitoring endangered species

2) **Internships with Rural Technology NGOs**: Collaborate with technology-focused non-profit organizations to offer internships where students can get involved in technology projects, community outreach programs, and policy advocacy initiatives

3) **Wildlife Rehabilitation Centres**: Students can gain valuable experience by volunteering or interning at wildlife rehabilitation centres. Here, they can learn about renewable energy sources, rehabilitation techniques, and the challenges faced in rural technology first-hand

4) **Botanical Gardens or Arboreta Internships**: Botanical gardens and arboreta often have horticulture-focused programs where students can assist in plant conservation efforts, learn about seed banking, rare plant propagation, and habitat restoration

5) **GIS and Remote Sensing Training**: Offer training workshops or courses in Geographic Information Systems (GIS) and remote sensing techniques specific to rural technology. These skills are highly valuable for analysing and mapping habitats, tracking species distributions, and identifying conservation priorities.

6) **Community-based rural technology Projects**: Encourage students to collaborate with local communities on rural technology initiatives. This could involve organizing rural technology education workshops, conducting renewable energy sources surveys with community participation, or implementing sustainable livelihood projects.

7) **Agriculture Genetics Laboratories**: Provide opportunities for students to work in conservation genetics laboratories where they can learn about DNA sequencing, population genetics analysis, and its applications in agriculture sector.
8) **Rural Technology Policy and Advocacy**: Offer training sessions or workshops focused on rural technology policy and advocacy, where students can learn about environmental law, policy-making processes, and strategies for effective advocacy on rural technology issues.
9) **Ecotourism and Interpretation Programs**: Partner with eco-lodges, nature reserves, or ecotourism operators to provide training in ecotourism management and interpretation techniques. This can help students understand the importance of sustainable tourism in conservation efforts and develop skills in agriculture education and interpretation.
10) **Rural Technology Impact Assessment (RTIA) Training**: RTIA is a critical component of many rural technology projects. Providing training in RTIA methodologies and procedures can equip students with skills necessary for assessing the potential agriculture impacts of development projects and proposing measures.

Learning Outcomes

1. The students will be able to describe the condition of rural area.
2. The students will be able to justify the role and responsibility of agriculture value in rural area.
3. Describe the expected consequences of rural technology and the role of agriculture sector.

Note: Any other areas relevant to the concerned subject

For M.Sc. Rural Technology students, hands-on training experiences are crucial for honing their skills and preparing them for the field. These training opportunities enhance student's practical skills but also provide them with valuable networking opportunities and real-world experiences that can boost their career prospects in the field of rural technology.

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(FIELD PROJECT)

Course Code : MRT/OJT/FP/563-P	**No. of Credits: 04**	**Course Title: Field Project**
		Hours : 08 Hrs./Week

Course Objective :

1. To increase awareness amongst the concept of rural technology.
2. To be able to interpret field project ideas using various weathering conditions.
3. To create and maintain a "double income for farmer" of major production areas so as to boost export of Agriculture Sector.

Additional field project ideas for the subject area

1) Evaluation of Plant-Insect Interactions in Agro ecosystems: Implications for Pest Management.
2) Investigating the Role of Keystone Species in Maintaining Ecosystem Stability.
3) Characterization of Proximate analysis in substrate: Potential for Biogas.
4) Analysis of Rural Technology and Habitat Preferences in Urban vs. Rural Landscapes.
5) Comparative Study of Traditional vs. Molecular Taxonomic Approaches in Species Identification.
6) Assessment of Genetic Variation in Wild and Cultivated Populations of Medicinal Plants.
7) Mapping Wetland Ecosystems and Assessing Their Contribution to Biodiversity Conservation.
8) Exploring the Issues of rural technology on Wildlife Corridors and Connectivity.
9) Evaluation of Remote Sensing Techniques for Monitoring Coral Reef Health
10) Investigating the Effects of Land Use Change on Soil Microbial Community Composition.
11) Assessment of Genetic Diversity & Population Structure of Amphibians in Fragmented Habitats.
12) Assessment of comparison between primary and secondary nutrient.
13) Investigating the Role of Microbial Communities in Soil Nutrient Cycling and Productivity.
14) Assessing the Impacts of Invasive Plant Species on Native Flora and Fauna.
15) Exploring the Relationship Between evaporation and transpiration.

Learning Outcomes

1. The students will be able to describe the condition of rural area.
2. The students will be able to justify the role & responsibility of agriculture value in rural area.
3. Describe the expected consequences of rural technology and the role of agriculture sector.

Note: Any other areas relevant to the concerned subject

These additional project ideas cover various aspects of rural technology, ecosystem dynamics, and the application of biotechnological and phylogenetic approaches in understanding and managing natural systems. Students can select or modify these topics based on the interest, available resources and research objectives. "Students are encouraged to propose their own field project topics within the course's scope, focusing on rural technology, taxonomy, remote sensing, solar energy wind power botany horticulture floriculture food technology and etc. Projects should align with personal interests and contribute to understanding rural technology efforts. Approval from the Subject Teacher is required for project selection."