

**CIRCULAR NO.SU/Sci. & Tech./University Deptt./NEP/25/2023**

It is hereby inform to all concerned that, the syllabi prepared by the Departmental Committee and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted **the following curriculum of All Post Graduate Degree Courses as per Norms of National Education Policy – 2020 under the Faculty of Science & Technology run at University Department, Dr.Babasaheb Ambedkar Marathwada University, Aurangabad** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Syllabi of the Department under BAMU Aurangabad.	Semester
1.	M.Sc.Electronics	Ist to IVth Semester
2.	M.Sc.Rural Technology	Ist Semester
3.	M.Sc.Coservation of Biodiversity	Ist 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/2023/10560-69

Date:- 22.08.2023.

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*Deputy Registrar,
Academic Section*

Copy forwarded with compliments to :-

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

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

**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)

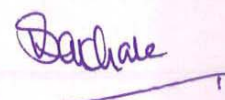
Course Structure and Curriculum

(Outcome based Credit System)


Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Subject: Rural Technology

(Effective from 2023-24)


Barhale

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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.

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 multi-disciplinary Institute covering all disciplines of science, technology, social sciences, agricultural sciences, trade and managerial subjects.

2. Course Structure

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

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: Ist

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		3	-	3	-	14
	MRT/MJ/501-T		3	-	3	-	
	MRT/MJ/502-T		3	-	3	-	
	MRT/MJ/503-P		-	2	-	1	
	MRT/MJ/504-P		-	2	-	1	
	MRT/MJ/505-P		-	2	-	1	
	MRT/MJ/506-P		-	4	-	2	
DSE (Choose any one from pool of courses)	MRT/DSE/507-T		3		3		04
	MRT/DSE/508-P			2		1	
	or						
	MRT/DSE/509-T		3		3		
	MRT/DSE/510-P			2		1	
	or						
	MRT/DSE/511-T		3		3		
RM	MRT/DSE/512-P			2		1	04
	MRT/RM/513-T		4	-	4	-	
			16	12	16	06	22 credits

1. Major Mandatory (DSC)

MRT/MJ/500-T	Natural Rural Resources
MRT/MJ/501-T	Crop Production Technology
MRT/MJ/502-T	Irrigation Technology
MRT/MJ/503-P	Lab-I: Natural Rural Resources
MRT/MJ/504-P	Lab-II: Crop Production Technology
MRT/MJ/505-P	Lab-III: Irrigation Technology
MRT/MJ/506-P	Lab-IV: Indigenous Technical Knowledge System

2. Discipline Specific Electives: (Choose any one from Pool /Basket)

MRT/DSE/507-T	Fundamentals of Biodiversity and Conservation
MRT/DSE/508-P	Lab-I: Fundamentals of Biodiversity and Conservation
or	
MRT/DSE/509-T	Watershed Management - I
MRT/DSE/510-P	Lab-II: Watershed Management - I
or	
MRT/DSE/511-T	Animal Husbandry
MRT/DSE/512-P	Lab-III: Animal Husbandry

3. Research Methodology (RM): MRT/RM/513-T
Class: M. Sc. First Year Semester: IInd 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		3		3		14
	MRT/MJ/551-T		3		3		
	MRT/MJ/552-T		3		3		
	MRT/MJ/553-T		2		2		
	MRT/MJ/554-P			2		1	
	MRT/MJ/555-P			2		1	
	MRT/MJ/556-P			2		1	
DSE (Choose any one from pool of courses)	MRT/DSE/557-T		3		3		04
	MRT/DSE/558-P			2		1	
	or						
	MRT/DSE/559-T		3		3		
	MRT/DSE/560-P			2		1	
	or						
	MRT/DSE/561-T		3		3		
	MRT/DSE/562-P			2		1	
OJT/FP	MRT/OJT/FP/563-T		-	8	-	4	04
			14	16	14	08	22 credits

1. Major Mandatory (DSC)

MRT/MJ/550-T	Agriculture Structures and Environmental Control
MRT/MJ/551-T	Food Processing Technology-I
MRT/MJ/552-T	Drying of Farm Crops
MRT/MJ/553-T	Rural Health Management
MRT/MJ/554-P	Lab-I: Agriculture Structures and Environmental Control
MRT/MJ/555-P	Lab-II: Food Processing Technology-I
MRT/MJ/556-P	Lab-III: Drying of Farm Crops

2. Discipline Specific Electives: (Choose any one from Pool /Basket)

MRT/DSE/557-T	Green House Technology
MRT/DSE/558-P	Lab-I: Green House Technology
or	
MRT/DSE/559-T	Nursery Techniques Management
MRT/DSE/560-P	Lab-II: Nursery Techniques Management
or	
MRT/DSE/561-T	Climate Change
MRT/DSE/562-P	Lab-III: Climate Change

3. OJT/FP-1: Field Project-I: MRT/OJT/FP/563-P

Class: M. Sc. Second Year**Semester: IIIrd****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		3		3		14
	MRT/MJ/601-T		3		3		
	MRT/MJ/602-T		3		3		
	MRT/MJ/603-T		2		2		
	MRT/MJ/604-P			2		1	
	MRT/MJ/605-P			2		1	
	MRT/MJ/606-P			2		1	
DSE (Choose any one from pool of courses)	MRT/DSE/607-T		3		3		04
	MRT/DSE/608-P			2		1	
	or						
	MRT/DSE/609-T		3		3		
	MRT/DSE/610-P			2		1	
	or						
	MRT/DSE/611-T		3		3		
RP-1	MRT/612-P			2		1	04
	MRT/612-P			2		1	
			14	16	14	08	22 credits

1. Major Mandatory (DSC)

MRT/MJ/600-T	Watershed Management –II
MRT/MJ/601-T	Food Processing Technology-II
MRT/MJ/602-T	Rural Tourism
MRT/MJ/603-T	ICT in Rural Technology
MRT/MJ/604-P	Lab-I: Watershed Management –II
MRT/MJ/605-P	Lab-II: Food Processing Technology-II
MRT/MJ/606-P	Lab-III: Rural Tourism

2. Discipline Specific Electives: (Choose any one from Pool /Basket)

MRT/DSE/607-T	Organic Farming
MRT/DSE/608-P	Lab-I: Organic Farming
or	
MRT/DSE/609-T	Medicinal and Aromatic Plants
MRT/DSE/610-P	Lab-II: Medicinal and Aromatic Plants
or	
MRT/DSE/611-T	Environment & Disaster Management
MRT/DSE/612-P	Lab-III: Environment & Disaster Management

3. RP-1: Research Project-1: MRT/649-P

Class: M. Sc. Second Year

Semester: IVth

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		3		3		14
	MRT/MJ/651-T		3		3		
	MRT/MJ/652-T		3		3		
	MRT/MJ/653-P			2		1	
	MRT/MJ/654-P			2		1	
	MRT/MJ/655-P			2		1	
DSE (Choose any one from pool of courses)	MRT/DSE/656-T		3		3		04
	MRT/DSE/657-P			2		1	
	Or						
	MRT/DSE/658-T		3		3		
	MRT/DSE/659-P			2		1	
	Or						
	MRT/DSE/660-T		3		3		
	MRT/DSE/661-P			2		1	
RP-2	MRT/RP-2/699-P			12		6	04
			12	20	12	10	22 credits

1. Major Mandatory (DSC)

MRT/MJ/650-T	Agricultural Biotechnology
MRT/MJ/651-T	Biomass Management & Utilization
MRT/MJ/652-T	Apiculture
MRT/MJ/653-P	Lab-I: Agricultural Biotechnology
MRT/MJ/654-P	Lab-II: Biomass Management & Utilization
MRT/MJ/655-P	Lab-III: Apiculture

2. Discipline Specific Electives: (Choose any one from Pool /Basket)

MRT/DSE/656-T	Farm Machine and Power
MRT/DSE/657-P	Lab-I: Farm Machine and Power
Or	
MRT/DSE/658-T	Power System for Renewable Energy Sources
MRT/DSE/659-P	Lab-II: Power System for Renewable Energy Sources
Or	
MRT/DSE/660-T	Mushroom Cultivation Techniques
MRT/DSE/661-P	Lab-III: Mushroom Cultivation Techniques

3. RP-1: Research Project-2: MRT/RP-2/699-P

3. 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.

4. 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 broad-based community participation for the rural development.

5. Program Educational 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 government in general and state government in particular.
3. It is innovative, skill and employment oriented to attract bright students to the discipline of rural development.

6. Program Outcomes (POs) and Program Specific Outcomes (PSOs)

PO1: To identify and provide solution to the problem encountered in rural life and livelihood.

PO2: To equip the students with skills to identify entrepreneurship opportunities in rural areas and to engage the local populations in productive activities for empowering rural societies.

PO3: To impart in-depth study and practical knowledge of the rural areas.

PO4: To disseminate technologies related to rural development and extension activities.

PSO1: To understand the multidimensional process that involves the reorganization and reorientation of economic and social system.

PSO2: To build capacity among the students community to understand and solve the problems pertaining to the rural lives.

PSO3: To guide the villagers through counseling and awareness gereneration camp.

PSO4: To help the villagers so that they can help themselves by raising the living standard.

7. Eligibility

- i) 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.
- ii) He/ She should have passed the Entrance Test conducted by the University with the specified criteria.

8. Duration

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

9. Medium of Instruction

The medium of instruction shall be in English.

10. Attendance

11. Evolution Methods/Scheme of Examination

12. CURRICULUM FOR SEMESTER – I

GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL DEVELOPMENT & RESEARCH

(MANDATORY SUBJECT- 01)

Course Code No.: MRT/MJ/500-T		No. of Credits: 03	Hours: 45
Course Title	Natural Rural Resources		
Course 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.			
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, social status.		09
V	Government initiatives and participation of various Stake holders for development and Protection of Rural resources.		09

Course 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.

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- 02)**

Course Code No.: MRT/MJ/501-T		No. of Credits: 03	Hours: 45
Course Title:	Crop Production Technology		
Course Objectives			
1. To prepares students to operate enterprises related to crop production			
2. To make students aware of technology in producing cereal grain, fiber, 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	

Course 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- 03)**

Course Code No.: MRT/MJ/502-T		No. of Credits: 03	Hours: 45
Course Title:	Irrigation Technology		
Course Objectives 1. To familiarize students with concepts and fundamentals of agricultural production system 2. To enable students, thorough understand soil-waterplant relationships 3. To give students comprehensive knowledge of crop water requirement and its estimations 4. and its estimations 5. To introduce students with basic criterions of irrigation project evaluation			
Unit	Course Content		Periods
I	Measurement of Land, i.e. size, shape, Calculation formulae, Land shaping, Leveling, grading, Measurement of slope & it's methods.		09
II	Measurement of water storage, flows, 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

Course Outcomes

By completing this course, the student will be able to:

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

Suggested Readings

1. "Drainage Engineering" by Luthin J N
2. "Irrigation -Theory and Practice" by Michael A M
3. "Irrigation Engineering" by Gurcharan Singh
4. "Irrigation And Drainage" by LENKA D
5. "Irrigation and Drainage Engineering" by Peter Waller and Muluneh Yitayew

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH
(MANDATORY SUBJECT- 01)**

Course Code No.: MRT/MJ/503-P		No. of Credits: 01	Hours: 30
Course Title	Natural Rural Resources		
Course 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.			
Unit	Course Content		Periods
I	Nature and Characteristics of Rural Resources 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	Land Resources 1) To Study of Land Resources and its Importance 2) To Study of soil Properties 3) To Study of different types of rocks available in India (Maharashtra)		06
III	Water resource 1) To Study of water resources 2) To Study of water erosion and water conservation or its management for rural development area 3) To Study of Irrigation method, issues in rural area and its remedies		06
IV	Living Resources 1) To Study of living resources 2) To Study of forest and its management for precipitation 3) To Study of ecology and role of ecology between wide life and farmers.		06
V	Human Resources 1) To Study of human resources 2) To Study of issue in rural human resources 3) To Study remedies on human resources		06

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH
(MANDATORY SUBJECT- 02)**

Course Code No.: MRT/MJ/504-P		No. of Credits: 01	Hours: 30
Course Title:	Crop Production Technology		
Course 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- 03)**

Course Code No.: MRT/MJ/505-P		No. of Credits: 01	Hours: 30
Course Title:	Irrigation Technology		
Course 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 4. To introduce students with basic criterions of irrigation project evaluation			
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

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH
(MANDATORY SUBJECT- 04)**

Course Code No.: MRT/MJ/506-P		No. of Credits: 02	Hours: 60
Course Title:	Indigenous Technical Knowledge System		
Course Objectives			
1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.			
Unit	Course Content		Periods
I	Introduction to traditional knowledge 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	Protection of traditional knowledge 1) To Study of the need and importance of protecting traditional knowledge. 2) To Study of the value of traditional knowledge in the global economy 3) To Study of role of government to harness of traditional knowledge.		12
III	Legal framework and Traditional Knowledge 1) To Study of various enactments related to the protection of traditional knowledge 2) To Study of the legal frame work traditional knowledge. 3) 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	Traditional knowledge and intellectual property 1) To Study of concepts of Intellectual property Rights to protection of the traditional knowledge 2) To Study of Strategies to increase protection of traditional knowledge 3) To Study of the global legal FORA for increasing protection of Indian traditional knowledge		12
V	Traditional knowledge in different sectors 1) To Study of the traditional knowledge in different sectors. 2) To Study of traditional knowledge importance in conservation and sustainable development of environment 3) To Study of Food security of the country and protection of traditional knowledge		12

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
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(ELECTIVE SUBJECT- 01)**

Course Code: No: MRT/DSE/507-T		No. of Credits: 03	Hours: 45
Course Title:		Fundamentals of Biodiversity and Conservation	
Course Objectives			
1.To define different ecosystems and biological diversity			
2.To extend the importance of interactions among the species			
3.To demonstrate the importance of maintains, conservation of ecosystem			
4.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		09

	5.6. Alternate species for future food securities (examples); Job's tear plant (<i>Coix lacrymajobi</i>) Indian wild buffalo (<i>Bubalus arnee</i>) Mithun (<i>Bos frontalis</i>). Hybrids between wild and domestic species (e.g. Mithun) Conservation of economically important aquatic species	
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Course Outcomes

At the end of this course students should be able to

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
4. To understand threats posed by global climate change to biodiversity

Suggested Readings:

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

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH
(ELECTIVE SUBJECT- 01)**

Course Code No.: MRT/DSE/508-P		No. of Credits: 01	Hours: 30
Course Title:		Fundamentals of Biodiversity and Conservation	
Course Objectives			
1.To define different ecosystems and biological diversity			
2.To extend the importance of interactions among the species			
3.To demonstrate the importance of maintains, conservation of ecosystem			
4.To illustrate the significance of conservation of agricultural biodiversity			
Unit	Course Content		Periods
I	Biodiversity 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	Values of Biodiversity 1) To Study of values of biodiversity 2) To Study of Ecological Economics 3) To Study of biodiversity and sustainable development		06
III	Threats to Biodiversity 1) To Study of threats to biodiversity 2) To Study of impact of human development on biodiversity 3) To Study of effect of pollution on biodiversity		06
IV	Conservation Planning and Climate Change 1) To Study of conservation planning and climate change 2) To Study of integrated strategies for conservation 3) To Study of REDD+, Synergies between sustainable use of biodiversity and climate change		06
V	Conservation of Agricultural Biodiversity 1) To Study of conservation of agriculture biodiversity 2) To Study of significance of seed bank and artificial seeds in conservation 3) To Study of conservation of live stock species/varites		06

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH**

(ELECTIVE SUBJECT- 02)

Course Code No.: MRT/DSE/509-T		No. of Credits: 03	Hours: 45
Course Title:		WATERSHED MANAGEMENT – I	
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

Course outcomes

Students will be able to;

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 Rainwater Technology Handbook: Rainharvesting 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
4. “Hydrology and Water Resources Engineering” by S K Garg
5. “Engineering Hydrology” by K Subramanya

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH
(ELECTIVE SUBJECT- 02)**

Course Code No.: MRT/DSE/510-P		No. of Credits: 01	Hours: 30
Course Title:		WATERSHED MANAGEMENT – I	
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 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	Natural Resources 1) To Study of Units of Measurement of water & land 2) To Study of Needs & availability in watershed 3) To Study of size & shape of watershed		06
III	Soil & Water Conservation – 1) To Study of soil and water erosion 2) To Study of soil and water conservation 3) To Study of different measures for soil and water conservation		06
IV	Treatment on land – 1) To Study of trenches and bunding 2) To Study of farm pond and recharging of wells bores 3) To Study of land capability and land use planning		06
V	Climates 1) To Study of climates related to metrological lab 2) To Study of evaporation and evapotranspiration 3) To Study of instruments of metrological Lab		06

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH
(ELECTIVE SUBJECT- 03)**

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

Course Outcomes

1. Determine and know the standards of care for animals in a colony setting.
2. Use safe handling techniques and aids for moving and restraining healthy cats and dogs.
3. Observe and document typical behaviours, attitudes and health indicators of cats and dogs.
4. Carry out industry standard animal husbandry activities within a colony setting.

Suggested Readings

1. A Textbook Of Animal Husbandry- G C Banerjee
2. Advanced Animal Nutrition- D. V Reddy
3. Agricultural Economics- S Subba Reddy
4. Animal husbandry & veterinary science- T.N. Palanivelu
5. Animal Husbandry- Gyan Deep Singh, Anmol Publishers
6. Animal Physiology- K. A. Goyal, Rastogi Publishing
7. Animal Physiology- KavitaJuneja, Anmol Publishers
8. Basics Of Animal Physiology- MonalisaKar, Anmol Publishers
9. Biotech's Dictionary Of Animal Husbandry – Daya Publishing
10. Biotechnology Expanding Horizons – B D Singh, Kalyani Publishers

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH**

(ELECTIVE SUBJECT- 03)

Course Code : MRT/DSE/512-P		No. of Credits: 01	Hours: 30
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	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	1) To Study of Measures and factors affecting fertility in livestock 2) To Study of reproductive system of livestock's 3) To Study of milk method of livestock's		06
III	1) To Study of Selection and breeding of livestock for higher milk and meat production. 2) To Study of Feeding and management of calves 3) To Study of growing heifers and milk animals & other classes of animal.		06
IV	1) To Study of animal housing principles space requirement for different species of livestock. 2) To Study of different disease of livestock's 3) To Study of disease control measures sanitation and care breeding		06
V	1) To Study of poultry Farm 2) To Study of Buffalo Farm 3) To Study of sheep and goat farm		06

**GOPINATHRAO MUNDE NATIONAL INSTITUTE OF RURAL
DEVELOPMENT & RESEARCH**

(RESEARCH METHODOLOGY)

Course Code No.: MRT/DSE/513-T		No. of Credits: 04	Hours: 60
Course Title:		RESEARCH METHODOLOGY	
<u>Course Objectives</u> 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 will get the knowledge of data collection, tabulation, analysis and presentation of data. 4. Students can know how to collect the research data through experimentation, questioner, by direct observations and sensitivity study of spatial and temporal data. 5. Students will know importance of statistical analysis, errors occurring in the collected research data and proper interpretation of research analysis. 6. 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

Course Outcomes

Students should be able to:

1. Explain the different research approaches, scientific methods, criteria for good researches.
2. Describe the problems encountered while working on research plan, field and laboratory problems.
3. Collect research data through experimentation, questionnaire by direct observations and sensitivity study of spatial and temporal data.
4. Infer the importance of statistical analysis, errors occurring in the collected research data and proper interpretation of produced research
5. Design the research project with the help of review of produced research, techniques of interpretation, published literature and proper layout of research.
6. 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 Creswell, University of Nebraska. Lincoln.
“The Essence of Research Methodology, A Concise Guide for Master & Ph.D. students in management science, by Jan Jonker & Bartjan Pennink, Springer.

13. Curriculum for Semester – II

14. Curriculum for Semester -III

15. Curriculum for Semester - IV