
	<p><b>Department of Agronomy</b>  <b>Mahatma Phule Krishi Vidyapeeth</b>  <b>Rahuri-413 722, Dist. Ahmednagar (MS)</b></p>	
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## Master's Programme in Agronomy

### Course Layout

#### Minimum Credit Requirements

Sr. No.	Subject	Minimum credit (s)
1.	Major	20
2.	Minor	09
3.	Supporting	06
4.	Seminar	01
5.	Research	20
	<b>Total Credits</b>	<b>56</b>
	Compulsory Non Credit Courses	06

Sr. No.	Course Number	Course Title	Credits
<b>A) Major subjects (Min. 20 credits)</b>			
1.	AGRON 501	Modern Concepts in Crop Production	3+0=3
2.	AGRON 502	Soil Fertility and Nutrient Management	2+1=3
3.	AGRON 503	Principles and Practices of Weed Management	2+1=3
4.	AGRON 504	Principles and Practices of Water Management	2+1=3
5.	AGRON 505	Agrometeorology and Crop Weather Forecasting	2+1=3
6.	AGRON 512	Dry Land Farming and Watershed Management	2+1=3
7.	AGRON 513	Principles and Practices of Organic Farming	2+1=3
<b>B) Minor Subjects (Min. 9 credits)</b>			
1.	Soils 501	Soil Physics	2+1=3
2.	PP 501	Mineral Nutrition	2+1=3
3.	Soils 509	Soil, Water and Air Pollution	2+1=3
<b>C) Supporting Subjects (Min. 6 credits)</b>			

1.	Stat.511	Statistical Methods for Applied Science	2+1=3
2.	Stat.512	Experimental Design	2+1=3
<b>D) Seminar (1 credit)</b>			
		Seminar	0+1=1
<b>E) Master's Research (20 credits)</b>			
		Master's Research	0+20=20
<b>F) Non Credit Compulsory Courses (Min. 6 credits)</b>			
1.	PGS 501	Library and Information Services	0+1=1
2.	PGS 504	Basic Concepts in Laboratory Techniques	0+1=1
3.	PGS 502	Technical Writing and Communication Skills	0+1=1
4.	PGS 503	Intellectual Property and its Management in Agriculture	1+0=1
5.	PGS 505	Agricultural Research Ethics and Rural Development Programmes	1+0=1
6.	PGS 506	Disaster Management	1+0=1

## Course Contents

### A) Major Subjects

**COURSE NO - AGRON 501**  
**COURSE TITLE: MODERN CONCEPTS IN CROP PRODUCTION**  
**(3+0=3)**

#### Theory

##### UNIT I

Crop growth analysis in relation to environment; Agro-ecological zones of India.

##### UNIT II

Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.

##### UNIT III

Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield.

##### UNIT IV

Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress.

##### UNIT V

Integrated farming systems, organic farming and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture.

#### Theory Teaching Schedule

Sr. No.	Lecture No.	Topics to be Covered	Weightage (%)
1	1-21	Crop growth analysis in relation to environment	3
2	3	Agro – ecological zones of India	3
3	4-5	Quantitative agro-biological principles and	4

		inverse yield nitrogen law	
4	6-7	Mitscherlich yield equation its interpretation and applicability, Baule unit	3
5	8	Effect of lodging incereals	3
6	9	Physiology of grain yield in cereals	4
7	10-12	Optimization of plant population and planting geometry in relation to different resources	6
8	13	Concept of ideal plant type	4
9	14-15	Crop modeling for desired crop yield	5
10	16-18	Scientific principles of crop production	4
11	19	Crop response production functions	3
12	20-22	Concept of soil plant relations	6
13	23-24	Yield and environmental stress	5
14	25-28	Integrated farming systems	6
15	29-31	Organic farming	6
16	32-35	Resource conservation technology including modern concept of tillage	7
17	36-38	Dry farming	7
18	39-41	Determining the nutrient needs for yield potentiality of crop plants	7
19	42-45	Concept of balance nutrition and integrated nutrient management	7
20	46-48	Precision agriculture	7
		<b>Total</b>	<b>100.00</b>

**Suggested Readings:**

Balasubramanian P & Palaniappan SP. 2021. Principles and Practices of Agronomy. Agrobios.

Fageria NK. 1992. Maximizing Crop yields. Marcel Dekker.

Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. Soil Fertility and Fertilizers. 7th Ed. Prentice Hall.

Paroda R.S. 2003. Sustaining our Food Security. Konark Publ.

Reddy SR. 2000. Principles of Crop Production. Kalyani Publ.

Sankaran S & Mudaliar TVS. 1997. Principles of Agronomy. The Bangalore Printing & Publ.

Singh SS. 2006. Principles and Practices of Agronomy. Kalyani.

**COURSE NO - AGRON 502**  
**COURSE TITLE: SOIL FERTILITY AND NUTRIENT MANAGEMENT**  
**(2+1=3)**

**Theory**

**UNIT- I**

Soil fertility and productivity- factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming- basic concepts and definitions.

**UNIT II**

Criteria of essentiality of nutrients; Essential plant nutrients- their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients.

**UNIT III**

Preparation and use of farmyard manure, compost, green manures, vermicompost, biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management.

**UNIT IV**

Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions.

**UNIT V**

Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic manures, economics of fertilizer use; integrated nutrient management; use of vermicompost and residue wastes in crops.

**Suggested Readings:**

- Brady NC & Weil RR 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.  
Fageria NK, Baligar VC & Jones CA. 1991. Growth and Mineral Nutrition of Field Crops. Marcel Dekker.  
Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. Soil Fertility and Fertilizers. 7th Ed. Prentice Hall.  
Prasad R & Power JF. 1997. Soil Fertility Management for Sustainable Agriculture. CRC Press.  
Yawalkar KS, Agrawal JP & Bokde S. 2000. Manures and Fertilizers. Agri-Horti Publ.

**COURSE NO - AGRON-502**  
**SOIL FERTILITY AND NUTRIENT MANAGEMENT**

**Theory Teaching Schedule**

<b>Lecture No.</b>	<b>Topic to be covered</b>	<b>Weightage (%)</b>
1 – 3	Soil fertility and productivity factors affecting it features of good soil management.	6
4 – 5	Problems of supply and availability of nutrients: Relation between nutrient supply and crop growth.	5
6 – 7	Organic farming ; basic concepts and definitions	5
8 – 10	Criteria of essentiality of nutrients: Essential plant nutrient, their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients.	10
11 – 14	Preparation and use of farmyard manure, compost, green manures, vermicompost, biofertilizers and other organic concentrates with their composition, availability and crop responses.	8
15 – 16	Recycling of organic wastes and residue management	4
17 - 18	Commercial fertilizers; composition, relative fertilizer value and cost.	5
19 -20	Crop response to different nutrients, residual effects and fertilizer use efficiency.	4
21 – 23	Fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency, nutrient interactions.	10
24 – 25	Time and methods of manure and fertilizer application, foliar application and its concept.	6
26 – 27	Relative performance of organic and inorganic manures	6
28	Economics of fertilizer use	6
29 – 31	Integrated nutrient management	10
32 – 33	Relative performance of organic and inorganic manures in crop growth and soil health.	4
34 – 35	Organic wastes and residue management	5
36 – 37	Use of vermicompost and residue wastes in crops	6

**PRACTICAL**

<b>Exercise No.</b>	<b>Title of the exercise</b>
1	Identification of different organic manures and fertilizers
2	Determination of soil pH
3	Estimation of electrical conductivity
4	Determination of organic carbon
5	Determination of NPK from FYM
6	Determination of total N from soil
7	Determination of available N from soil
8	Determination of available P from soil
9	Determination of available K from soil

10	Determination of Soil Sulphur
11	Estimation of N in plant
12	Estimation of P in plant
13	Estimation of K in plant
14	Estimation of S in plant
15	Nutrient requirement as per STCR equation
16	Interpretation of interaction effects and computation of economic and yield optimization

**COURSE NO - AGRON 503**  
**COURSE TITLE: PRINCIPLES AND PRACTICES OF WEED MANAGEMENT**  
**(2+1=3)**

**Theory**

**UNIT I**

Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices.

**UNIT II**

Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides.

**UNIT III**

Herbicide structure- activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management; weed control through bio-herbicides, myco-herbicides and allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation.

**UNIT IV**

Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control.

**UNIT V**

Integrated weed management; cost: benefit analysis of weed management.

**Suggested Readings:**

- Aldrich RJ & Kramer RJ. 1997. Principles in Weed Management. Panima Publ.  
Ashton FM & Crafts AS. 1981. Mode of Action of Herbicides. 2nd Ed. Wiley Inter-Science.  
Gupta OP. 2007. Weed Management- Principles and Practices. Agriobios.  
Mandal RC. 1990. Weed, Weedicides and Weed Control- Principles and Practices. Agro-Botanical Publ.  
Rao. VS. 2000. Principles of Weed Science. Oxford & IBH.  
Subramanian S, Ali AM & Kumar RJ. 1997. All about Weed Control. Kalyani.  
Zimdahl RL. 1999. Fundamentals of Weed Science. 2nd Ed. Academic Press.

**COURSE NO - AGRON 503**  
**COURSE TITLE: PRINCIPLES AND PRACTICES OF WEED MANAGEMENT**  
**(2+1=3)**

**Theory Teaching Schedule**

Sr. No.	Topics to be covered	Weightage (%)
<b>THEORY</b>		
<b>UNIT – I</b>		
1	Definition of weed, weed biology and ecology	3
2	Crop-weed competition including allelopathy	4
3 and 4	Principles and methods of weed control	7
5	Weed classification	3
6	Weed indices	3
<b>UNIT – II</b>		
7	Herbicides introduction and history of their development	3
8 and 9	Classification of herbicides based on chemical, physiological application and selectivity.	6
10	Mode and mechanism of action of herbicides.	4
<b>UNIT – III</b>		
11 and 12	Herbicide Structure – activity relationship	6
13	Factors affecting the efficiency of herbicides.	6
14	Herbicide formulations.	3
15	Herbicide mixtures	3
16	Herbicide resistance and management Effect of herbicides on microbes	3
17 and 18	Weed control through bio – herbicides, myco-herbicides and allelochemicals.	7
19 and 20	Degradation of herbicides in soil and plants. Pot culture herbicide persistency, leaching of herbicides.	7
21	Herbicide resistance in weeds and crops	4
22	Herbicide rotation	3
<b>UNIT – IV</b>		
23 and 24	Weed management in major crops and cropping systems	7
25	Parasitic weeds	3
26	Weed shifts in cropping systems	3
27 and 28	Control of aquatic, perennial, noxious and invasive weeds.	7
<b>UNIT – V</b>		
29	Integrated weed management	4
30	Cost : benefit analysis of weed management	3



## PRACTICAL

1 and 2	Identification of important weeds of different crops	
3	Preparation of weed herbarium	
4 and 5	Weed survey in crops and cropping systems	
6	Crop – weed competition studies	
7	Preparation of spray solutions of herbicides for high and low volume sprayers.	
8 and 9	Use of various types of spray pumps and nozzles and calculation of swath width.	
10	Economics of weed control	
11 and 12	Herbicide resistance analysis in plant and soil	
13	Bioassay of herbicide resistance	
14	Residue analysis of herbicides.	
15	Calculation of herbicidal requirement	

**COURSE NO. : AGRON 504**  
**COURSE TITLE: PRINCIPLES AND PRACTICES OF WATER MANAGEMENT**  
**(2+1=3)**

**Theory**

**UNIT I**

Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.

**UNIT II**

Soil water movement in soil and plant; transpiration; soil-water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition.

**UNIT III**

Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; microirrigation system; fertigation; management of water in controlled environments and poly-house.

**UNIT IV**

Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency.

**UNIT V**

Excess of water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing.

**Suggested Readings:**

- Lenka D. 1999. Irrigation and Drainage. Kalyani  
Michael AM. 1978. Irrigation: Theory and Practice. Vikas Publ.  
Paliwal KV. 1972. Irrigation with Saline Water. IARI Monograph, New Delhi.  
Panda SC. 2003. Principles and Practices of Water Management. Agrobios.  
Prihar SS & Sandhu BS. 1987. Irrigation of Food Crops-Principles and Practices. ICAR.  
Reddy SR. 2000. Principles of Crop Production. Kalyani.  
Singh Pratap & Maliwal PL. 2005. Technologies for Food Security and Sustainable Agriculture. Agrotech Publ.

**COURSE NO. : AGRON 504**  
**COURSE TITLE: PRINCIPLES AND PRACTICES OF WATER MANAGEMENT**  
**(2+1=3)**

**Theory Teaching Schedule**

<b>Lecture No.</b>	<b>Topic to be covered</b>	<b>Weightage (%)</b>
1 – 2	Water and its role in plants	4
3	Water resources of India, major irrigation projects	2
4	Extent of area and crops irrigated in India and different states.	2
5	Soil water movement in soil and plants	8
6	Transpiration; soil-water-plant relationships	8
7 – 8	Water absorption by plants	4
9 – 10	Plant response to water stress	8
11	Crop plant adaptation to moisture stress condition	4
12	Soil, plant and meteorological factors determining water needs of crops	4
13 – 14	Scheduling, depth and methods of irrigation	8
15 – 16	Micro irrigation system; fertigation	8
17	Management of water in controlled environments and poly-houses.	4
18 – 20	Water management of the crops and cropping systems	4
21 – 22	Quality of irrigation water and management of saline water for irrigation	8
23 – 25	Water use efficiency.	6
26 – 27	Excess of soil water and plant growth	2
28 – 29	Water management in problem soils	6
30 – 31	Drainage requirement of crops.	4
32 – 34	Methods of field drainage, their layout and spacing	6

## PRACTICAL

Exercise No.	Practical
1	Measurement of soil water potential by using tensiometer
2-3	Measurement of soil water potential by using pressure plate membrane apparatus
4-5	Study on soil-moisture characteristics curves
6-7	Water flow measurements using different devices
8	Determination of hydraulic conductivity of soil
9	Determination of irrigation requirements
10	Determination of soil profile moisture deficit
11-12	Calculation of irrigation efficiency
13-14	Determination of infiltration rate
15	Determination of saturated / unsaturated hydraulic conductivity
16	Computation of water requirement of crops by using modified Penman formula

**COURSE NO. : AGRON 505**  
**COURSE TITLE: AGROMETEOROLOGY AND CROP WEATHER**  
**FORECASTING**  
**(2+1=3)**

### Theory

#### UNIT I

Agro meteorology - aim, scope and development in relation to crop environment; composition of atmosphere, distribution of atmospheric pressure and wind.

#### UNIT II

Characteristics of solar radiation; energy balance of atmosphere system; radiation distribution in plant canopies, radiation utilization by field crops; photosynthesis and efficiency of radiation utilization by field crops; energy budget of plant canopies; environmental temperature: soil, air and canopy temperature.

#### UNIT III

Temperature profile in air, soil, crop canopies; soil and air temperature effects on plant processes; environmental moisture and evaporation: measures of atmospheric temperature and relative humidity vapor pressure and their relationships; evapo-transpiration and meteorological factors determining evapo-transpiration.

#### UNIT IV

Modification of plant environment: artificial rain making, heat transfer, controlling heat load, heat trapping and shading; protection from cold, sensible and latent heat flux, controlling soil

moisture; monsoon and their origin, characteristics of monsoon; onset, progress and withdrawal of monsoon; weather hazards, drought monitoring and planning for mitigation.

#### UNIT V

Weather forecasting in India- short, medium and long range; aerospace science and weather forecasting; benefits of weather services to agriculture, remote sensing; application in agriculture and its present status in India; atmospheric pollution and its effect on climate and crop production; climate change and its impact on agriculture.

#### Suggested Readings:

- Chang Jan Hu. 1968. Climate and Agriculture on Ecological Survey. Aldine Publ.  
 Critchfield HJ. 1995. General Climatology. Prentice Hall of India.  
 Das PK. 1968. The Monsoons. National Book Trust Publ.  
 Lal DS. 1998. Climatology. Sharda Pustak Bhawan.  
 Lenka D. 1998. Climate, Weather and Crops in India. Kalyani.  
 Mavi H.S. 1994. Introduction to Agro-meteorology. Oxford & IBH.  
 Mavi HS & Tupper GJ. 2004. Agrometeorology: Principles and Application of Climate Studies in Agriculture. Haworth Press.  
 Menon PA. 1991. Our Weather. National Book Trust Publ.  
 Sahu DD. Agrometeorology and Remote Sensing: Principles and Practices Agrobios.  
 Variraju R & Krishnamurty. 1995. Practical Manual on Agricultural Meteorology. Kalyani.  
 Varshneya MC & Balakrishana Pillai P. 2003. Textbook of Agricultural Meteorology. ICAR.

**COURSE NO. : AGRON 505**  
**COURSE TITLE: AGROMETEOROLOGY AND CROP WEATHER**  
**FORECASTING**  
**(2+1=3)**

#### Theory Teaching Schedule

Lect. No.	Topics to be covered	Weightage (%)
1-2	Agro meteorology – History , aim, scope and development in relation to crop environment	6
3-4	Composition of atmosphere	5
5	Distribution of atmospheric pressure and wind	3
6	Characteristics of solar radiation	3
7-8	Energy balance of atmosphere system; radiation distribution in plant canopies	6
9-11	Radiation utilization by field crops; photosynthesis and efficiency of radiation utilization by field crops	7
12	Energy budget of plant canopies	3
13-14	Environmental temperature: soil, air and canopy temperature	6
15-16	Temperature profile in air, soil, crop canopies	5
17-18	Soil and air temperature effects on plant processes; environmental moisture and evaporation:	6
19	Evapo-transpiration and meteorological factors determining evapo-transpiration	4
20-22	Modification of plant environment: artificial rain making, heat transfer, controlling heat load, heat trapping and	9

	shading	
23	Protection from cold, sensible and latent heat flux, controlling soil moisture	4
24-25	Monsoon and their origin, characteristics of monsoon; onset, progress and withdrawal of monsoon	7
26	Weather hazards, drought monitoring and planning for mitigation	4
27-28	Weather forecasting in India- short, medium and long range	7
29	Aerospace science and weather forecasting; benefits of weather services to agriculture	4
30	Remote sensing; application in agriculture and its present status in India	4
31	Atmospheric pollution and its effect on climate and crop production	4
32-33	Climate change and its impact on agriculture	7

### PRACTICAL

<ul style="list-style-type: none"> <li>• Visit to agro-meteorological observatory and to record sun-shine hours, wind velocity, wind direction, relative humidity, soil and air temperature, evaporation, precipitation and atmospheric pressure.</li> </ul>
<ul style="list-style-type: none"> <li>• Measurement of solar radiation outside and within plant canopy</li> </ul>
<ul style="list-style-type: none"> <li>• Measurement/estimation of evapo-transpiration by various methods</li> </ul>
<ul style="list-style-type: none"> <li>• Measurement/estimation of soil water balance</li> </ul>
<ul style="list-style-type: none"> <li>• Rainfall variability analysis.</li> </ul>
<ul style="list-style-type: none"> <li>• Determination of heat-unit requirement for different crops</li> </ul>
<ul style="list-style-type: none"> <li>• Measurement of crop canopy temperature</li> </ul>
<ul style="list-style-type: none"> <li>• Measurement of crop canopy temperature</li> </ul>
<ul style="list-style-type: none"> <li>• Measurement of soil temperatures at different depths</li> </ul>
<ul style="list-style-type: none"> <li>• Remote sensing and familiarization with agro-advisory service bulletins</li> </ul>
<ul style="list-style-type: none"> <li>• Study of synoptic charts and weather reports, working principle of automatic weather station</li> </ul>
<ul style="list-style-type: none"> <li>• Visit to solar observatory</li> </ul>

**COURSE NO. : AGRON 512**  
**COURSE TITLE: DRYLAND FARMING AND WATERSHED MANAGEMENT**  
**(2+1=3)**

**Theory**

**UNIT I**

Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture.

**UNIT II**

Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization environment for water availability; crop planning for erratic aberrant weather conditions.

**UNIT III**

Stress physiology and resistance to drought adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.

**UNIT IV**

Tillage, tith, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); anti-transparent; soil and crop management techniques, seedling and efficient fertilizer use.

**UNIT V**

Concept of watershed resource management, problems, approach and components.

**Suggested readings:**

- Das NR. 2007. Tillage and Crop Production. Scientific Publishers.  
Dhopte AM. 2002. Agrotechnology for Dryland Farming. Scientific Publ.  
Dhruv Narayan VV. 2002. Soil and Water Conservation  
Research in India. ICAR.  
Gupta US. (ED.). 1995. Production and Improvements of Crops for Drylands. Oxford & IBH.  
Katyaj JC & Farrington J. 1995. Research for Rainfed Farming. CRIDA.  
Rao SC & Ryan J. 2007. Challenges and Strategies of Dryland Agriculture. Scientific Publishers.  
Singh P & Maliwal PL. 2005. Technologies for Food Security and Sustainable Agriculture. Agrotech Publishing Company.  
Singh RP. 2005. Sustainable Development of Dryland Agriculture in India. Scientific Publ.  
Singh SD. 1998. Arid Land Irrigation and Ecological Management. Scientific Publishers.  
Venkateshwarlu J. 2004. Rainfed Agriculture in India. Research and Development Scenario. ICAR.

**COURSE NO. : AGRON 512**  
**COURSE TITLE: DRYLAND FARMING AND WATERSHED MANAGEMENT**  
**(2+1=3)**

**Theory Teaching Schedule**

<b>Lect. No.</b>	<b>Topics to be covered</b>	<b>Weightage (%)</b>
1-2	Definition, concept and characteristics of dry land farming	7
3	Dry land versus rainfed farming	4
4-5	Significance and dimensions of dry land farming in Indian agriculture	7
6-7	Soil and climatic parameters with special emphasis on rainfall characteristics	7
8-9	Constraints limiting crop production in dry land areas	7
10-11	Types of drought, characterization environment for water availability	7
12	Crop planning for erratic aberrant weather conditions	4
13-14	Stress physiology and resistance to drought adaptation of crop plants to drought	7
15-16	Drought management strategies	7
17-18	Preparation of appropriate crop plans for dry land areas	5
19	Mid contingent plan for aberrant weather conditions	4
20-22	Tillage, tith, frequency and depth of cultivation, compaction in soil tillage	6
23-24	Concept of conservation tillage; tillage in relation to weed control and moisture conservation	6
25-27	Techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics)	6
28-29	Anti-transpirant; soil and crop management techniques	6
30	seedling and efficient fertilizer use	4
31-32	Concept of watershed resource management, problems, approach and components	6

**PRACTICAL**

• Seed treatment, seed germination and crop establishment in relation to soil moisture contents
• Moisture stress effects and recovery behaviour of important crops
• Estimation of moisture index and aridity index
• Spray of anti-transparent and their effect on crops
• Collection and interpretation of data for water balance equations
• Water use efficiency
• Preparation of crop plans for different drought conditions
• Study of field experiments relevant to dryland farming
• Visit to dryland research stations and watershed projects



**COURSE NO. : AGRON 513**  
**COURSE TITLE: PRINCIPLES AND PRACTICES OF ORGANIC FARMING**  
**(2+1=3)**

**Theory**

**UNIT I**

Organic farming- concept and definition, its relevance to India and global agriculture and future prospects; land and water management – land use, minimum tillage; shelter zones, hedges, pasture management, agro-forestry.

**UNIT II**

Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures and biofertilizers.

**UNIT III**

Farming systems, crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.

**UNIT IV**

Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides.

**UNIT V**

Socio- economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures; organic farming and national economy.

**Suggested Readings:**

- Ananthakrishnan TN (ED.). 1992. Emerging Trends in Biological Control of Phytophagous Insects. Oxford & IBH.
- Gaur AC. 1982. A Manual of Rural Composting, FAO/UNDP Regional Project Document, FAO.
- Lampin N. 1990. Organic Farming. Press Books, Ipswich, UK.
- Palaniappan SP & Anandurai K. 1999. Organic Farming – Theory and Practice. Scientific Publ.
- Rao BV Venkata. 1995. Small Farmer Focused Integrated Rural Development: Socio-economic Environment and Legal Perspective: Publ. 3, Parisaraprajna Parishtana, Bangalore.
- Reddy MV. (Ed.). 1995. Soil Organisms and Litter Decomposition in the Tropics. Oxford & IBH.
- Sharma A. 2002. Hand Book of Organic Farming. Agrobios.
- Sigh SP. (ED.). 1994. Technology for Production of Natural Enemies. PDBC, Bangalore.
- Subba Rao NS. 2002. Soil Microbiology. Oxford & IBH.
- Trivedi RN. 1993. A Text Book of Environmental Sciences, Anmol Publ.
- Veeresh GK, Shivashankar K & Suiglachar MA. 1997. Organic Farming and Sustainable Agriculture. Association for Promotion of Organic Farming, Bangalore.
- WHO. 1990. Public Health Impact of Pesticides Used in Agriculture. WHO.
- Woolmer PL & Swift MJ. 1994. The biological Management of Tropical Soil Fertility. TSBF & Wiley.

**COURSE NO. : AGRON 513**  
**COURSE TITLE: PRINCIPLES AND PRACTICES OF ORGANIC FARMING**  
**(2+1=3)**

**Theory Teaching Schedule**

Sr. No.	Topics to be covered	Weightage (%)
<b>UNIT – I</b>		
1	Organic farming-concept and definition	4
2	Relevance of organic farming to India and global agriculture and future prospects	3
3 to 6	Land and water management-land use, tillage, conservation tillage, minimum tillage, shelter zones, hedges, pasture management and agroforestry.	13
<b>UNIT – II</b>		
7	Organic farming and water use efficiency	4
8 to 10	Organic farming and soil fertility, nutrient recycling and organic residues	10
11 and 12	Organic manures and composting	7
13	Soil biota and decomposition of organic residues, earthworms and vermicompost.	3
14	Green manures	3
15 and 16	Biofertilizers	7
<b>UNIT – III</b>		
17	Farming systems	3
18 and 19	Crop rotations, multiple and relay cropping systems, Intercropping in relation to maintenance of soil productivity	7
<b>UNIT – IV</b>		
20	Control of weeds	4
21 and 22	Diseases and insect pest management	7
23	Biological agents.	3
24 and 25	Pheromones, biopesticides and bioherbicides	7
<b>UNIT- V</b>		
26	Socio – economic impacts	3
27	Marketing and export potential	3
28	Inspection and certification of organic products	3
29	Labelling and accreditation procedures	3
30	Organic farming and national economy	3

## PRACTICAL

1	Aerobic methods of making compost
2	Anaerobic methods of making compost
3	Making of vermicompost
4 to 6	Identification and nursery raising of important agroforestry trees and trees for shelter belts
7	Efficient use of biofertilizers
8	Technique of treating legume seeds with <i>Rhizobium</i> cultures.
9 and 10	Use of <i>Azotobacter</i> , <i>Azospirillum</i> and PSB cultures in field
11	Visit to organic farm
12 and 13	Quality standards and inspection of organic produce from organic farms
14 and 15	Certification, labelling and accreditation procedures for farm produce from organic farms

## B. Minor Subjects

**Course Title : SOIL PHYSICS**

**Course No. : SOILS – 501**

**2+1=3**

### Syllabus

#### UNIT I

Scope of soil physics and its relation with other branches of soil science; soil as a three phase system.

#### UNIT II

Soil texture, textural classes, mechanical analysis, specific surface

#### UNIT IV

Soil structure – genesis, types, characterization and management soil structure; soil aggregation, aggregate stability; soil tilth, characteristics of good soil tilth; soil crusting – mechanism, factors affecting and evaluation; soil conditioners; puddling, its effect on soil physical properties, clod formation.

#### UNIT V

Soil water content and potential, soil water retention, soil water constants, measurement of soil water content, energy state of soil water, soil water potential, soil moisture characteristic curve, hysteresis, measurement of soil moisture potential.

#### UNIT VI

Water flow in saturated and unsaturated soils, Poiseuille's law, Darcy's law; hydraulic conductivity, permeability and fluidity, hydraulic diffusivity, measurement of hydraulic conductivity in saturated and unsaturated soils.

#### UNIT VII

Infiltration, internal drainage and redistribution; evaporation, hydrologic cycle, field water balance, soil plant atmosphere continuum.

#### UNIT IX

Composition of soil air, renewal of soil air – convective flow and diffusion; measurement of soil aeration requirement for plant growth, soil air management

## **UNIT X**

Modes of energy transfer in soils, energy balance, thermal properties of soil, measurement of soil temperature, soil temperature in relation to plant growth, soil temperature management.

### **Practical**

- Mechanical analysis by international pipette and hydrometer methods
- Measurement of Atterbergs limits
- Aggregate analysis-dry and wet
- Measurement of soil water content by different methods
- Measurement of soil water potential by using tensiometer and gypsum blocks
- Determination of soil moisture characteristics curve and computation of pore size distribution
- Determination of hydraulic conductivity under saturated and unsaturated conditions
- Determination of infiltration rate of soil
- Determination of aeration porosity and oxygen diffusion rate
- Soil temperature measurements by different methods
- Estimation of water balance components in bare and cropped fields

### **Suggested Readings:**

- Baver L. D., Gardner W. H. and Gardner W. R. 1972. *Soil Physics*. John Wiley and Sons.
- Ghildyal, B. P. and Tripathi, R. P. 2001. *Soil Physics*. New Age International.
- Hanks, J. R. and Ashcroft, G. L. 1980. *Applied Soil Physics*. Springer Verlag.
- Hillel, D. 1972. *Optimizing the Soil Physical Environment towards Greater Crop Yields*. Academic Press.
- Hillel, D. 1980. *Application of Soil Physics*. Academic Press.
- Hillel, D. 1980. *Fundamentals of Soil Physics*. Academic Press.
- Hillel, D. 1998. *Environmental of Soil Physics*. Academic Press.
- Hillel, D. 2003. *Introduction to Environmental Soil Physics*. Academic Press.
- Indian Society of Soil Science. 2002. *Fundamentals of Soil Science*. ISSS, New Delhi
- Kirkham, D. and Powers, W. L. 1972. *Advanced Soil Physics*. Wiley Interscience.
- Kohnke, H. 1968. *Soil Physics*. McGraw Hill.
- Lal, R. and Shukla, M. K. 2004. *Principles of Soil Physics*. Marcel Dekker.
- Oswal, M. C. 1994. *Soil Physics*. Oxford and IBH.
- Saha, A. K. 2004. *Text Book of Soil Physics*. Kalyani.

**SOIL, WATER AND AIR POLLUTION**

Course No. SOILS 509

2+1

**Theory:**

Sr. No.	Lecture No.	Topics to be covered	Weightage In Marks
1	1, 2, 3	Pollution-definition, agril. Pollution soil water and air pollution, causes, nature and its extent	5
2	4, 5	Nature and sources of pollutants – pesticides, fertilizer, industrial, urban waste, acid rains and oilspills	5
3	6	Pollution of soil, water and air, their CPC standards	3
4	7, 8, 9	Effect of pollutants on plant, animals, micro organisms in soil, and human beings	7
5	10, 11	Sewage and industrial effluents-definition, composition, properties and their extent	6
6	12, 13, 14, 15	Sewage and industrial effluents, their effect on soil, water and air and plants and human being, Microorganisms soil as sink for waste disposal their methods merits and demerits	9
7	16, 17, 18	Pesticides definition, classification, degradation behaviour in soil, water and air. Their effect on soil properties and microorganisms	9
<b>8</b>	<b>19</b>	<b>Mid term examination</b>	
9	20, 21, 22, 23, 24	Toxic elements in pollutants, their hazardous effects on plant growth, human health, effect on soil available elements, microbial population	10
10	25, 26, 27	Effect of pollutants on water resources due to leaching of nutrients and pesticides from soil	7
11	28, 29, 30, 31	Effect of pollutants on emission of greenhouse gases, their extents, nature and effect on environment	8
12	32, 33, 34	Use of improved techniques such as dilution, degradation, incineration, concentration, filtration, land disposal etc. nature and extents, merits and demerits	6
13	35, 36	Remote sensing definition, scope in agriculture, and its use in monitoring and management of soil and water pollution	5

**Practical:**

Sr. No.	Exercise No.	Topics to be covered
1	1	Visit to various industry to study the nature and impact on soil and plant
2	2, 3	Sampling of sewage water, sewage sludge soild/liquid industrial waste,

		polluted soil and plant
3	4	Estimation of dissolved and suspended solids in liquid pollutant and pH, EC of solid samples
4	5, 6	Estimation of BOD (Biological) and COD (chemical, oxygen demand) of liquid waste.
5	7, 8	Estimation of nitrate and ammoniacal nitrogen, phosphorus in sample
6	9, 10	Estimation of heavy metal in effluents
7	11, 12, 13	Estimation of heavy metals in soil and plants
8	14, 15	Management of contaminants in soil and plants to safe guard food safer
9	16	Collection of air sample
10	17	Determination of particulate matter in air samples
11	18	Determination of sulphur in air sample

<b>D) Supporting Subjects (Min. 6 credits)</b>			
1.	Stat.511	Statistical Methods for Applied Science	2+1=3
2.	Stat.512	Experimental Design	2+1=3
<b>F) Seminar (1 credit)</b>			
		Seminar	0+1=1
<b>G) Master's Research (20 credits)</b>			
		Master's Research	0+20=20
<b>F) Non Credit Compulsory Courses (Min. 6 credits)</b>			
1.	PGS 501	Library and Information Services	0+1=1
2.	PGS 504	Basic Concepts in Laboratory Techniques	0+1=1
3.	PGS 502	Technical Writing and Communication Skills	0+1=1
4.	PGS 503	Intellectual Property and its Management in Agriculture	1+0=1
5.	PGS 505	Agricultural Research Ethics and Rural Development Programmes	1+0=1
6.	PGS 506	Disaster Management	1+0=1