

B. Sc. (Hons) Agriculture

Agronomy

- **Syllabus**
- **Teaching Schedule**
- **Suggested Readings**

B. Sc. (Hons) Agriculture
Departmentwise list of courses

Agronomy

Sr. No.	Semester	Course No.	Credits	Course Title
1	I	AGRO 111	2(1+1)	Fundamentals of Agronomy-I
2	I	AGRO 112	2(1+1)	Introductory Agro-meteorology and Climate change
3	II	AGRO 123	2(1+1)	Fundamentals of Agronomy-II
4	III	AGRO 234	2(1+1)	Crop Production Technology-I (Kharif crops)
5	III	AGRO 235	2(1+1)	Rainfed Agriculture and Watershed Management
6	IV	AGRO 246	2(1+1)	Crop Production Technology-II (Rabi crops)
7	IV	AGRO 247	1(1+0)	Farming System and Sustainable Agriculture
8	IV	AGRO 248	2(1+1)	Principles of Organic Farming
9	V	AGRO 359	1(0+1)	Practical Crop Production-I (Kharif crops)
10	V	ELE AGRO 3510	3(2+1)	Weed Management
11	VI	AGRO 3611	1(0+1)	Practical Crop Production-II (Rabi crops)
12	VI	AGRO 3612	2(1+1)	Geo-informatics and Nano-technology and Precision Farming
13	VIII	ELM AGRO 4813	10(0+10)	Organic Farming Production Technology
14	VIII	ELM AGRO 4814	10(0+10)	Commercial production of organic inputs (Proposed)

Course :	AGRO 111		Credit:	2(1+1)	Semester-I
Course title:	Fundamentals of Agronomy-I				

Syllabus

Theory: Agronomy, its scope and relationship with other sciences, Tillage and tilth, Seeds and sowing. Crop density and geometry, Crop nutrition, Manures and fertilizers. Nutrient use efficiency. Growth and development of crops. Plant ideotypes. Crop rotation and its principles. Study of crop adaptation and its distribution. Harvesting, threshing and Storage of field crops. Weeds - characteristics and classification. Crop - weed competition. Concept of weed management. Herbicides – Classification, selectivity and resistance of herbicide, allelopathic effect of weed.

Practical: Identification of seeds and crop plants at different growth stages. Study of different tillage implements, Identification of fertilizers and pesticides. Identification of weed flora in different field crops. Agro climatic zones of Maharashtra and India, Operational tillage viz., primary, secondary, inter-tillage. Sowing, harvesting, harvesting implements and working with them. Calculation of Plant Population, Seed rate, fertilizer and herbicide dose for different field crops. Methods of seed germination and viability test. Practice of seed treatments in different field crops. Computation of weed indices Application of manures and fertilizer in important field crops. Application of herbicides in different field crops. Yield contributing characters and yield estimation in different field crops.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1	Agronomy, its definition, scope, role of Agronomist and relationship of Agronomy with other sciences.	4
2	Tillage, its definition, objects of tillage, types of tillage, tillage implements and factors affecting tillage, Effect of tillage on soil and crop growth.	8
3	Tilth: its definition, characteristics and ideal tilth, Modern concepts of tillage, minimum, zero and stubble mulch tillage, importance of puddling.	6
4	Seed, its definition, characteristics of quality seed, seed treatment and its objectives seed dormancy, causes of seed dormancy and multiplication, stages of seed.	8
5	Methods of sowing seed and sowing implements.	4
6	Effect of plant population on growth and yield, Planting geometry viz., solid, paired and skipped row planting	6
7	Role of plant nutrients in crop production, Importance of manures and fertilizers and its classification.	6

Lecture	Topic	Weightage (%)
8	Methods and time of application of manures, fertilizers and green manuring.	6
9	Nutrient use efficiency, meaning and factors affecting nutrient use efficiency.	6
10	Growth and development, its definition, growth curve and factors affecting growth and development.	6
11	Plant ideotypes, its definition and types of ideotypes.	6
12	Crop rotation, its definition, principles and advantages of crop rotation.	6
13	Study of crop adaptation and its distribution	4
14	Weeds, its definition, characteristics of weeds, merits and demerits of weeds, classification of weeds, meaning of crop weed competition and its period in different crops.	6
15	Principles and methods of weed management viz., cultural, mechanical, chemical, biological weed control methods and integrated weed management.	6
16	Classification of herbicides, its selectivity and resistance, Allelopathic effect of weed.	6
17	Crop harvesting, signs of maturity in different field crops, Physiological and crop maturity, Methods of threshing crops, Cleaning, Drying and Storage of field crops.	6
	Total	100

b) Practical

Experiment	Topic
1	Identification of seeds and crop plants at different growth stages.
2	Identification of different tillage implements.
3	Identification of fertilizers and pesticides.
4	Identification of weed flora in different field crops.
5	Study of agro climatic zones of Maharashtra and India.
6 & 7	Operational tillage viz., primary, secondary,, inter-tillage, sowing, harvesting, harvesting implements, Working with them.
8 & 9	Calculation of Plant Population, Seed rate, fertilizer and herbicide dose for different field crops.
10	Determination of purity and germination percentage of seed, Methods of seed germination.
11	Study of viability test and practice of seed treatments in different field crops.
12	Preparation methods of FYM and compost. (Computation of weed indices)
13	Preparation methods of vermicompost and green manuring.

Experiment	Topic
14 & 15	Study of different methods of manures and fertilizer application and their application practice in important field crops.
16	Methods of application of herbicides in different field crops.
17	Study of yield contributing characters and yield estimation in different field crops.

Suggested Readings:

- 1) Chhidda Singh, Modern techniques of raising field crops. Oxford and IBH Publishing Co. Ltd., Bangalore.
- 2) Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.
- 3) Hand book of Agriculture, ICAR Publication.
- 4) Palaniappan, S.P., Cropping Systems in the tropics – Principles and Practices. Willey Eastern Ltd., New Delhi.
- 5) Panda, S.C., 2006. Agronomy Agribios Publication, New Delhi.
- 6) Reddy, S.R. Principles of Agronomy Kalyani Publishers, Ludhiana, India.
- 7) Sankaran, S and Subbiah Mudliyar, V.T., 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
- 8) Vaidya, V.G., Sahasrabudhe, K.R. and Khuspe, V.S. Crop production and field experimentation. Continental Prakashan, Vijaynagar, Pune.
- 9) Rao V.S. (2006), Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.
- 10) Gupta, O.P. (2008), Modern Weed Management Agribios India Publication.

Course :	AGRO 112		Credit:	2(1+1)	Semester-I
Course title:	Introductory Agro-meteorology and Climate change				

Syllabus

Theory: Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical : Visit of Agro-meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of windrose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Teaching Schedule/ Lesson plan

a) Theory

Lecture	Topic	Weightage (%)
1	Meaning and scope of agricultural meteorology	4
2	Earth's atmosphere - its composition, extent and structure ; Atmospheric weather variables	9
3	Atmospheric pressure – its variation with height	2
4	Wind-types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze	8

Lecture	Topic	Weightage (%)
5	Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo	8
6	Atmospheric temperature - temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth	8
7	Atmospheric humidity - concept of saturation, vapour pressure, process of condensation, formation of dew, fog, mist, frost, cloud	8
8	Precipitation –process of precipitation, types of precipitation such as rain, snow, sleet and hail	8
9	Cloud formation and classification	6
10	Artificial rainmaking ; Monsoon mechanism and importance in Indian agriculture	4
11	Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold wave	8
12	Agriculture and weather relations	5
13	Modifications of crop microclimate	4
14	Climatic normals for crop and livestock production	4
15	Weather forecasting - types of weather forecast and their uses	4
16	Climate change , climatic variability, global warming , causes of climate change and its impact on regional and national Agriculture	10
	Total	100

b) Practical

Experiment	Topic
1	Visit of Agrometeorological Observatory.
2	Site selection of observatory, exposure of instruments and weather data recording.
3	Measurement of air temperatures, its tabulation and variation.
4	Measurement of soil temperature.
5	Measurement of rainfall.
6 & 7	Measurement of wind speed and wind direction.
8 & 9	Measurement of evaporation with the help of open pan evaporation.
10	Measurement of evapotranspiration.
11	Measurement of sunshine duration using Campbell Stokes sunshine recorder.
12	Measurement of solar radiation.
13	Measurement of Atmospheric pressure.

Experiment	Topic
14	Measurement of Relative Humidity with the help of Assmann's psychrometer
15	Determination of Vapour pressure, RH and dew point temperature using hygrometric table
16	Preparation of Synoptic charts.
17	Study of Automatic Weather Station

Reference Books

- 1) Agricultural Meteorology- G.S.L.H.V. Prasad Rao, Kerala Agricultural University Publications.
- 2) Text book of Agricultural Meteorology – M. C. Varshneya and P. Balkrishna Pillai.
- 3) Introduction to Agro-meteorology- H. S. Mavi
- 4) Our Atmosphere- Smita Bhutani
- 5) Atmosphere, weather and climate – Barry R. G. and Charley R. J. The English Language Book Society and Mathuen and Co. Ltd., Sultolk.
- 6) Climate, weather and crops in India – D. Lenka.
- 7) Meteorology – S. R. Ghadekar

Course :	AGRO 123		Credit:	2(1+1)	Semester-II
Course title:	Fundamentals of Agronomy -II				

Syllabus

Theory: Water Resources of India and Maharashtra and Development Water Management - Role of water in plants. Irrigation scheduling criteria and methods. Quality of irrigation water. Crop water requirement. Water use efficiency, Soil - water-plant relationship. Classification of Soil Water, Soil Moisture Constants, Soil Moisture characteristic curve. Volume Mass Relationship, retention of soil water .Water absorption. Rooting characteristics of plants and moisture extraction patterns and SPAC. Water requirement of different Agronomic crops. Evaporation, Transpiration, Evapo-transpiration, Potential-evapotranspiration, effective rainfall and consumptive use of water. Water Use efficiency, Irrigation Efficiencies. Water logging and Management of water logged soils. Crop water management techniques in problematic areas.

Practical: Estimation of soil moisture. Determination of Bulk and Particle Density, Determination of Field Capacity. Determination of PWP. Study of Soil moisture Measuring Devices and its installation, Determination of Infiltration. Estimation of Gross water requirement, Net water requirement, Irrigation Interval, Available Soil Moisture, Scheduling of Irrigation . Methods of surface irrigation, Irrigation Layouts, Study of Drip and Subsurface irrigation Systems and their components, Installation of drip Irrigation system in field, Fertigation , Care and Maintenance of Drip system, Sprinkler, Rain gun, Installation of various measuring devices and Measurement of Irrigation water, Visit to Atomized Irrigation Unit, Visit to ill-drained fields. Study of Drainage systems.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1	Definition of Irrigation and Water Management, its Objectives and Role of water in plants.	8
2	Water Resources of India and Maharashtra and Development	6
3& 4	Soil- water-plant Relationship, Soil Water, Movement of soil water, Infiltration, permeability, percolation, seepage.	12
5	Volume Mass Relationship, retention of soil water and factors affecting it.	6
6	Classification of Soil Water, Soil Moisture Constants, Soil Moisture characteristic curve	8
7	Water absorption, factors affecting absorption, rooting characteristics, Moisture extraction patterns and SPAC	6
8 & 9	Water requirement, Irrigation Requirement, Gross Irrigation, Net Irrigation, Irrigation interval and Methods of estimation of water requirement and factors affecting it	12
10	Water requirement of different Agronomic crops	6

Lecture	Topic	Weightage (%)
11 & 12	Evaporation, Transpiration, Evapo-transpiration Potential-evapotranspiration, effective rainfall and consumptive use of water and factors affecting it.	12
13	Water Use efficiency, Irrigation Efficiencies and factors affecting it.	6
14	Criteria for scheduling of irrigation, Methods of irrigation, advantages, disadvantages.	6
15	Water Quality parameters, Water logging, Causes of water logging, Management of water logged soils.	6
16	Crop management techniques in problematic areas i.e. saline, alkaline, acidic soils.	6
	Total	100

b) Practical

Experiment	Topic
1	Estimation of soil moisture by different methods
2	Determination of Bulk and Particle Density.
3	Determination of Field Capacity by field method and by pressure plate membrane apparatus
4	Determination of PWP by sunflower method and by pressure plate membrane apparatus
5	Study of Soil moisture Measuring Devices and its installation.
6	Determination of Infiltration by Double Ring Infiltrometer.
7	Estimation of Gross water requirement, Net water requirement, Irrigation Interval, Available Soil Moisture.
8	Scheduling of Irrigation by different methods.
9	Methods of surface irrigation, Irrigation Layouts.
10	Study of Drip and Subsurface irrigation Systems and their components.
11	Installation of drip Irrigation system in field.
12	Study of Drip System, Fertigation, Care and Maintenance of Drip system.
13	Study of Pressurized irrigation system, Sprinkler, Rain gun.
14	Installation of various measuring devices and Measurement of Irrigation water.
15	Visit to Atomized Irrigation Units.
16	Visit to ill-drained fields and study of Drainage systems.

Suggested Readings:

- 1) Principles of Agronomy by S. R. Reddy
- 2) Crop production and Management by Y. B. Morachand
- 3) Principles of Agronomy by Sankaran S and V. T. SubbiahMudliyar
- 4) Principles of Agronomy by T. Yellamanda Reddy and G. H. Sankara Reddy
- 5) Irrigation Water Managemnt by Dilip Kumar Muzumdar
- 6) Principles and Practices of Water Management by A. M. Michel
- 7) Irrigation and Drainage by Lenka D. .
- 8) Soil Management and organic farming By S.C. Panda Agrobios

Course :	AGRO 234		Credit:	2(1+1)	Semester-III
Course title:	Crop Production Technology-I (Kharif crops)				

Syllabus

Theory:Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices **Intercropping, pest and disease management** and yield of *Kharif*crops. Cereals – rice, maize, sorghum, pearl millet and finger millet, **Small millets*** pulses-pigeonpea, mungbean, urdbean, **Cowpea, kidney bean and horse gram***; oilseeds- groundnut, soybean, **Sesame and Niger***; fibre crops- cotton & Jute; forage crops- sorghum, cowpea, cluster bean, napier, **pearlmillet and maize***, Grasses - **marvel***.

Practical:Rice nursery preparation, transplanting of Rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of *kharif* season crops, effect of sowing depth on germination of *kharif* crops, identification of weeds in *kharif* season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of *kharif*season crops, study of crop varieties and important agronomic experiments at experimental farm. study of forage experiments, morphological description of *kharif*season crops, visit to research centres of related crops. **Mechanization in crop cultivation of *kharif*crops.***

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1 - 5	Cereals – Rice, maize, <i>kharif</i> , sorghum, pearl millet and minor millet	35
6 -9	Pulses – Pigeon pea, mungbean, urdbean, cowpea, kidney bean and horse gram	20
10 - 12	Oilseeds – Groundnut, sesame, soybean and Niger	20
13-15	Fiber crops – cotton and jute	15
16-18	Forage crops – Sorghum, cowpea, pearl millet and maize: Grasses–Napier and Marvel	10
	Total	100

b) Practical

Experiment	Topic
1	Rice nursery preparation, transplanting of Rice
2	Sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton,
3	To study the effect of seed size on germination and seedling vigour of <i>kharif</i> season crops,

Experiment	Topic
4	Effect of sowing depth on germination of kharif crops
5	Calculations of plant population, seed rate and fertilizers doses.
6	Identification of weeds in kharif season crops.
7&8	Top dressing and foliar feeding of nutrients
9&10	Study of yield contributing characters and yield calculation of kharif season crop
11	Study of crop varieties and important agronomic experiments at experimental farm
12&13	Study of forage experiments
14	Morphological description of kharif season crops,
15	Harvesting and threshing of cereals, pulses, oil seeds and cash crops.
16	Visit to research centres of related crop

Suggested Readings:

1. Modern technique of raising field crops by Chiddasingh
2. Agronomy of field crop by S.R. Reddy
3. Hand book of Agriculture, ICAR New Delhi

Course :	AGRO 235		Credit:	2(1+1)	Semester-III
Course title:	Rainfed Agriculture and Watershed Management				

Syllabus

Theory: Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India, Problems and prospects of *rainfed* agriculture in India; Soil and climatic conditions prevalent in *rainfed* areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, Factors affecting watershed management

Practical: Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1	Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India	8
2-3	Problems and prospects of rainfed agriculture in India	8
4	Soil and climatic conditions prevalent in rainfed areas	10
5	Soil and water conservation techniques	10
6-7	Drought: types, effect of water deficit on physio- morphological characteristics of the plants	10
8-9	Crop adaptation and mitigation to drought	8
10-11	Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices	10
12	Management of crops in rainfed areas	8
13-14	Contingent crop planning for aberrant weather conditions	10

Lecture	Topic	Weightage (%)
15	Concept, objective, principles and components of watershed management	10
16	Factors affecting watershed management	8
	Total	100

b) Practical

Experiment	Topic
1	Studies on Agro-climate zones of India
2	Studies on Agro-climate zones of Maharashtra
3-4	Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons
5	Studies on cropping pattern of different rainfed areas in the country
6	Demarcation of rainfed area on map of India
7	Studies on interpretation of meteorological data (rainfall, temperature, humidity etc.)
8-9	Studies on critical growth stages of different crops and irrigation scheduling for survival of crops
10	Studies on drought, its classification and effect on crop growth
11	Study on effective rainfall and its calculations
12-13	Studies on different soil and moisture conservation practices for mitigating moisture stress
14	Studies on watershed, its characteristics and delineation of model watershed
15	Studies on field demonstration on soil and moisture conservation measures
16	Studies on field demonstration on water harvesting studies
17	Visit to rainfed research station/ watershed areas

Suggested Readings:

- 1) Sustainable Development of Dryland Agriculture in India – R. P Singh
- 2) Dry Farming Technology in India – P. Rangaswamy
- 3) Dryland resources and Technology – Vol. 8 L.L Somani, K.W. Kaushal
- 4) Physiological Aspect of Dryland Farming – U.S Gupta
- 5) Principles of Agronomy S.R. Reddy
- 6) Dryland Technology – M.L. Jat, S.R. Bhakar, S.K. Shirma , A. K. Kothri
- 7) Climate, Weather and Crops in India – D. Lenka

Course :	AGRO 246		Credit:	2(1+1)	Semester-IV
Course title:	Crop Production Technology-II (Rabi crops)				

Syllabus

Theory :Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, Rabi Sorghum and maize, pulses-chickpea, lentil, peas, French bean oilseeds-rape seed, mustard and sunflower; Safflower, linseed sugar crops- sugarcane; Sugar beet, medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, Lucerne, oat., maize and sorghum and other crops –Tobacco* and sweet potato.

Practical :Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops, study of morphological characteristics of *rabi* crops, study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops. Mechanization in crop cultivation of *kharif* crops.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1 - 4	Cereals – Wheat, sorghum, barley and maize (grain corn, sweet corn and baby corn)	25
5-7	Pulses – Chickpea, lentil, pea, French bean	15
8.10	Oilseeds – Sunflower, safflower mustard and linseed	25
11-12	Sugar crop – Sugarcane and sugar beet	10
13-14	Other crops – Potato, tobacco and sweet potato	10
15-16	Medicinal and aromatic crops-mentha, lemon grass and citronella	05
16-18	Forage crops – Lucerne, berseem, maize, oat and sorghum	10
	Total	100

b) Practical

Experiment	Topic
1	Sowing methods of wheat
2	Sowing method of sugarcane,
3	Identification of weeds in rabi season crops,
4&5	Study of morphological characteristics of rabi crops
6	Calculations of plant population, seed rate and fertilizers doses.

Experiment	Topic
7&8	Study of yield contributing characters of rabi season crops
9	Study of yield and juice quality analysis of sugarcane
10 & 11	Study of important agronomic experiments of rabi crops at experimental farms.
12	Study of rabi forage experiments
13 &14	Oil extraction of medicinal crops
15	Visit to research stations of related crops.

Suggested Readings:

1. Modern technique of raising field crops by Chiddasingh
2. Agronomy of field crop by S.R. Reddy
3. Hand book of Agriculture, ICAR New Delhi

Course :	AGRO 247		Credit:	1(1+0)	Semester-IV
Course title:	Farming System and Sustainable Agriculture				

Syllabus

Theory: Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/institutes and farmers field.

Teaching Schedule

Theory

Lecture	Topic	Weightage (%)
1-2	Farming systems – Definition, scope, concept and objective of Farming Systems,.	8
3	Classification of Farming systems and factors affecting it.	4
4	Study of different components of Farming System and their maintenance	8
5-6	Definition of Cropping systems, cropping pattern, Multiple cropping systems and its classification, advantages and disadvantages.	8
7	Study of efficient Cropping systems and allied enterprises.	4
8& 9	Assessment tools for determining production and efficiencies in cropping systems and farming systems (Based on land use efficiency, biological potential and economic criteria).	12
10 & 11	Sustainable Agriculture: Definition, Principles, Goals, Problems and its importance in Agriculture, Sustainability Index and Conservation Agriculture	10
12	Impact of LEIA (Low External Input Agriculture) and HEIA (High External Input Agriculture) on crop productivity and sustainable agriculture.	8
13	Integrated Farming System, historical background, characteristics, objectives, components and its advantages.	10

Lecture	Topic	Weightage (%)
14	Development of site specific IFS models for different Agro climatic zones, its resource use efficiency and optimization technique	10
15	Farming systems in relation to environment, its resource cycling and flow of energy	10
16	Visit to various IFS models.	8
	Total	100

Suggested Readings:

- 1) Cropping systems Theory and Practice -Chatterjee B.N. and Maiti S.
- 2) Cropping Systems in Tropics – Principles and practices. -Palanniappan S.P.

Course :	AGRO 248		Credit:	2(1+1)	Semester-IV
Course title:	Principles of Organic Farming				

Syllabus

Theory:Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical :Visit to organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1	Organic Farming, Definition, Principles and its Scope in India and world	9
2 & 3	Initiative taken by Govt, NGO and Organizations for promotion of Organic Agriculture	10
4	Organic ecosystem and their concepts	7
5	Organic nutrient, resources and its fortification	8
6	Restriction to Nutrient use in Organic Farming	8
7	Choice of Crops and Varieties in Organic Farming	8
8 & 9	Fundamentals of insect pest and disease management under organic mode of production	7
10	Weed Management in Organic mode of Production	8
11	Operational structure of NPOP	5
12 & 13	Certification process and Standards of Organic Farming	10
14 & 15	Processing, Labeling and Economic consideration and its viability in Organic production	10
16	Export potential of Organic products	10
	Total	100

b) Practical

Experiment	Topic Details
1.	Visit to Organic Farm to study the various components and their utilization
2.	Study of Preparation methods for Enriched compost.
3.	Study of Preparation methods for Vermicompost and vermiwash.
4.	Study of biofertilizers and bio-inoculants
5.	Study of preparation of Biodynamic compost and cow pat pit
6.	Study of quality analysis of compost and vermicompost.
7.	Study of crop residue management and green manuring
8 & 9.	Study of indigenous technology knowledge (ITK) for nutrient, insect, disease and weed management.
10.	Study the method of preparation and Production cost of <i>Panchagavya</i> , <i>Beejamrut</i> and <i>Jeevamrut</i> in Organic farming
11.	Study the method of preparation and Production cost of <i>Dashparni</i> , <i>Neem Seed extract</i> , in Organic farming
12&13.	Study of post-harvest management in Organic Farming.
14 & 15.	Study of Quality aspects : Grading, Packing, Handling.
16.	Visit to Biocontrol Laboratory and Biofertilizer and vermicompost Unit

Suggested Readings:

- 1) Organic Farming for Sustainable Agriculture by Dahama A. K. Agrobios Publication.
- 2) Organic Farming: Theory and Practices by Palanippan, S.P. and Anaadurai, K.
- 3) Organic Farming in India, Problems and Prospects by Thapa, U. and Tripathi, P.
- 4) Trends in Organic Farming in India by Agrobios Publication
- 5) Handbook of Organic Farming.
- 6) Recent Developments in Organic farming by Gulati and Barik

Course :	AGRO 359		Credit:	1(0+1)	Semester-V
Course title:	Practical Crop Production-I (Kharif crops)				

Syllabus

Practical : Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students. Study of farm inventories and records.

(To get practical oriented knowledge to the student, 2 R area per student will be allotted for raising *kharif* crop of the region. The student has to raise the crop from sowing to harvesting threshing, drying, winnowing, storage and preparation of produce for marketing. Also he has to study the cost of cultivation, net return per student as well as per team of a group of students.)

Teaching Schedule

Practical

Experiment	Topic
1	Introduction, aims and objectives of practical crop production – Allotment of plot and its history.
2	Study of seed production of <i>kharif</i> crops
3	Study of mechanization and resource conservation of <i>kharif</i> crops
4	Study of physical and chemical properties of the allotted plot to the students.
5	Study of package of practices for growing <i>kharif</i> crop (timely, late and rainfed).
6	Study of farm inventories and records
7	Preparation of calendar of operation for <i>kharif</i> crop.
8	Study of preparatory, secondary tillage and seed bed preparation for <i>kharif</i> crop.
9	Sowing and seed treatment of <i>kharif</i> crop.
10	Study of integrated nutrient management of <i>kharif</i> crop.
11	Study of water management to <i>kharif</i> crop.
12	Determination of germination/emergence count of <i>kharif</i> crop.
13	Study of growth and yield contributing characters of <i>kharif</i> crop.
14	Study of interculturing and weed management in <i>kharif</i> crop.
15	Study of integrated insect pest and diseases management in <i>kharif</i> crop
16	Study of crop maturity signs and harvesting of <i>kharif</i> crops
17	Threshing, drying, winnowing, storage and preparation of produce for marketing of <i>kharif</i> crop.
18	Study of cost of cultivation and working out net returns per student

Experiment	Topic
19	Study of post-harvest technology of <i>kharif</i> crop.
20	Summary report of practical crop production
21	Study of weekly weather record for <i>kharif</i> season.

Note :

To get practical oriented knowledge to the student, 2 R area per student will be allotted for raising *kharif* crop of the region. The student has to raise the crop from sowing to harvesting threshing, drying, winnowing, storage and preparation of produce for marketing. Also he has to study the cost of cultivation, net return per student as well as per team of a group of students

Suggested Readings:

1. Modern technique of raising field crops by Chidda Singh
2. Agronomy of field crop by S.R. Reddy
3. Hand book of Agriculture, ICAR New Delhi

Course :	ELE AGRO 3510		Credit:	3(2+1)	Semester-V
Course title:	Weed Management (Elective)				

Syllabus

Theory :Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical :Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agro-chemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipment's. Calculations of herbicide doses and weed control efficiency and weed index.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1-2	Introduction and importance of weeds	6
3-4	Characteristics of weeds	6
5-6	Harmful and beneficial effects of weeds on ecosystem.	8
7-8	Classification of weeds, Shift of weed flora	6
9-10	Reproduction and dissemination of weeds	8
11	Classification of herbicides	6
12-13	Concept of adjuvant and surfactants	6
14	Herbicide formulation and their use	4
15-16	Introduction to mode of action of herbicides	6
17	Introduction to herbicide selectivity	4
18-19	Allelopathy and its application in weed management	8
20-21	Bio herbicides and their application in Agriculture	8
22-23	Concept of herbicide mixture and its utility in Agriculture	6
24-25	Herbicide compatibility with Agrochemicals	4
26	Herbicide compatibility with fertilizers	2
27-28	Integration of herbicides with non-chemical methods of weed management	6
29-30	Herbicide resistance and its management	6
	Total	100

b) Practical

Experiment	Topic
1-2	Identification of weeds
3	Techniques of weed preservation
4	Study of losses caused by weeds
5 - 6	Biology of important weeds
7	Study of herbicide formulation and herbicide mixtures
8	Study of herbicide in relation to Agrochemicals
9	Phyto-toxicity symptoms on crops and its measurement
10	Methods of herbicide application
11-12	Herbicides application equipments and their calibration
13	Calculation of herbicide dose
14	Computation of different weed indices
15	Visit to weed management experiments

Suggested Readings:

- 1) Aldrich, R.J. and Kramer R.J. (1997), Principles in Weed Management.
- 2) Gupta O.P. (2007), Weed management Principles and Practices.
- 3) Gupta, O.P. (2008), Modern Weed Management
- 4) Gupta, O.P. 1984. Scientific Weed Management Today and Tomorrows.
- 5) Jayakumar, R. and Jagannathan, R. (2007). Weed Science Principles.
- 6) Mandal R.C. (1999), Weed, Weedicides and Weed control Principles and Practices.
- 7) Rao V.S. (2006), Principles of Weed Science.

Course :	AGRO 3611		Credit:	1(0+1)	Semester-VI
Course title:	Practical Crop Production-II(Rabi crops)				

Syllabus

Practical: Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

(To get practical oriented knowledge to the student, 0.02 ha. area per student will be allotted for raising *rabicrops* of the region. The student has to raise the crop from sowing to harvesting threshing, drying, winnowing, storage and preparation of produce for marketing. Also he has to study the cost of cultivation, net return per student as well as per team of a group of students.)

Teaching Schedule

Practical

Experiment	Topic
1	Introduction, aims and objectives of practical crop production – Allotment of plot and its history.
2	Study of seed production of <i>rabi</i> crops
3	Study of mechanization and resource conservation of <i>rabi</i> crops
4	Study of physical and chemical properties of the allotted plot to the students.
5	Study of package of practices for growing <i>rabi</i> crop (timely, late and rainfed).
6	Preparation of calendar of operation for <i>rabi</i> crop.
7	Study of preparatory, secondary tillage and seed bed preparation for <i>rabi</i> crop.
8	Sowing and seed treatment of <i>rabi</i> crop.
9	Study of integrated nutrient management of <i>rabi</i> crop.
10	Study of water management to <i>rabi</i> crop.
11	Determination of germination/emergence count of <i>rabi</i> crop.
12	Study of growth and yield contributing characters of <i>rabi</i> crop.
13	Study of interculturing and weed management in <i>rabicrop</i> .
14	Study of integrated insect pest and diseases management in <i>rabi</i> crop
15	Study of crop maturity signs, harvesting of <i>rabi</i> crop
16	Threshing, drying, winnowing, storage and preparation of produce for marketing of <i>rabi</i> crop.
17	Study of cost of cultivation and working out net returns per student

Experiment	Topic
18	Study of post harvest technology of <i>rabi</i> crop
19	Summary report of practical crop production
20	Study of weekly weather record for <i>rabi</i> season.

Note :

To get practical oriented knowledge to the students, 40 R area per batch will be allotted for raising *rabi* crop of the region, viz., land preparation, sowing to harvesting, threshing, drying, winnowing, storage and preparation of produce for marketing. Study of cost of cultivation, net return and B:C ratio.

Suggested Readings:

1. Modern technique of raising field crops by Chiddasingh
2. Agronomy of field crop by S.R. Reddy
3. Hand book of Agriculture, ICAR New Delhi

Course :	AGRO 3612		Credit:	2(1+1)	Semester-VI
Course title:	Geo-informatics and Nano-technology and Precision Farming				

Syllabus

Theory : Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical : Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1	Precision agriculture: concepts and techniques; their issues and concerns reference for Indian agriculture	4
2	Geo-informatics system- Definition, concepts, tool and techniques; their use in Precision farming.	7
3	Crop discrimination and Yield monitoring	4
4	soil mapping; fertilizer recommendation using geospatial technologies	5
5	Spatial data and their management in GIS	8
6	Remote sensing concepts and application in agriculture	8
7	Image processing and interpretation	8
8	Global positioning system (GPS), components and its functions	9
9	Introduction to crop Simulation Models	5

Lecture	Topic	Weightage (%)
10	Uses of crop simulation models for optimization of Agricultural Inputs	7
11	STCR approach for precision agriculture	5
12	Nanotechnology- Definition, concepts and techniques	7
13	Brief introduction about nanoscale effects, nano-particles	5
14	Nano-pesticides, nano-fertilizers, nano-sensors	7
15	Use of nanotechnology in seed & water for scaling-up farm productivity.	6
16	Use of nanotechnology in fertilizer & plant protection for scaling up farm productivity	5
Total		100

b) Practical

Experiment	Topic
1	Introduction to GIS software, spatial data creation and editing
2	Introduction to image processing software
3	Visual and digital interpretation of remote sensing image by software
4	Generation of spectral profiles of different objects
5	Supervised and unsupervised classification and acreage estimation
6	Multispectral remote sensing for soil mapping
7	Soil fertility map by GIS
8	Creation of productivity and management zone by GIS
9	VRT technique for fertilizer recommendation
10	STCR technique for fertilizer recommendation for targeted yield
11	Calculation of crop stress geospatial technique
12	Agricultural Survey by GPS and DGPS
13	Formulation and characterization of nanoparticles
14	Applications of nanoparticles in agriculture
15	Projects related by precision farming.

Suggested Readings:

- 1) GIS : Fundamentals, Applications & Implementations – Dr. K Elangovan New India publishing Agency, New Delhi.
- 2) Remote sensing , GIS and wet land management - ErTasneemAbbasi& Prof. S.A. Abbasi