SWAMI VIVEKANAND SUBHARTI UNIVERSITY
UGC Approved Meerut

Ordinance No. :- V-141-B-12

(Approved in Academic Council meeting held on 11.03.2026

Proposed to be ratified in forthcoming executive council)

Evaluation Scheme and Syllabus

of

M.Sc. Agriculture (Specialization in Agronomy)

TWO – YEAR POST GRADUATE PROGRAM
(AS PER NEP-2020)

Keral Verma Subharti College of Science
Swami Vivekanand

SUBHARTI UNIVERSITY

Meerut
Effective from 2025-26

K. V. Subharti College of Science
S. V. Subharti University
NH-58, Byepass Road, Meerut

Programe Objective:

The **M.Sc. Agronomy programme** aims to provide students with advanced and specialized knowledge in crop production, soil–plant relationships, and sustainable farming practices. The major objectives of the programme are:

1. **To build a strong foundation in agronomic principles:** Equip students with in-depth understanding of crop physiology, soil management, nutrient dynamics, irrigation, and cropping systems.
2. **To develop advanced research skills:** Enable students to plan, execute, and analyze scientific experiments, conduct field research, and apply appropriate statistical tools for data interpretation.
3. **To promote sustainable and climate-smart agriculture:** Train students to design and recommend eco-friendly farming practices, resource-efficient technologies, and strategies for climate resilience and sustainable crop production.
4. **To enhance problem-solving abilities:** Prepare students to identify, analyze, and solve practical issues related to crop production, pest and weed management, soil fertility, and water use efficiency.
5. **To train students in modern agronomic tools and technologies:** Provide hands-on exposure to GIS, remote sensing, precision farming, farm mechanization, and other advanced tools used in modern agriculture.
6. **To prepare students for careers and higher studies:** Equip learners for positions in research institutions, universities, government agencies, agribusiness sectors, and prepare them for pursuing Ph.D. and other advanced specializations.

Programe Outcome:

PO-1 Apply Advanced Agricultural Knowledge: Demonstrate in-depth understanding of agricultural principles, crop production technologies, soil science, plant protection, and allied sciences.

PO-2Conduct Scientific Research: Design and execute research experiments, analyze data using modern statistical tools, and interpret results to address agricultural challenges effectively.

PO-3 Solve Real-World Agricultural Problems: Use scientific reasoning and innovative approaches to solve issues related to crop production, sustainability, pest management, soil fertility, climate resilience, and resource conservation.

PO-4 Use Modern Tools and Technology: Employ advanced agricultural instruments, ICT tools, GIS, remote sensing, and precision farming technologies to improve productivity and efficiency.

PO-5 Promote Sustainable Agriculture: Develop strategies for sustainable farming systems focusing on environmental protection, biodiversity conservation, and climate-smart agricultural practices.

PO-6 Enhance Communication and Extension Skills: Communicate scientific information effectively to farmers, students, and stakeholders, and contribute to agricultural extension and outreach programmes.

PO-7 Manage Agribusiness and Develop Entrepreneurship: Understand agribusiness principles, market trends, value addition, and develop entrepreneurial skills for self-employment and agribusiness ventures.

PO-8 Work Ethically and Professionally: Practice ethical research values, maintain professional integrity, and contribute responsibly to the agricultural sector and society.

PO-9 Pursue Lifelong Learning: Engage in continuous learning through participation in seminars, workshops, training programmes, and research activities to stay updated with advancements in agriculture.

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Agriculture

PG (M.Sc. Agriculture(Specialization in Agronomy) Courses offered by Department of Agriculture (Session 2025-26 onwards)

		I	II	Internship after II Sem	III	IV	Total
1	Core Course	16	16	**4**	8	4	44
2	Elective (DEC)	-	-		8	8	16
3	PC/Dissertation/Project Work	8	8		8	12	36
4	SEMINAR/VAC/OEC/EEC/CHM	2 (SEMINAR)	2 (CHM)		2 (OEC)	2 (EEC)	8
	Total	26	26		26	26	108

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List of all Courses under different categories for M.Sc. Agriculture (Specialization in Agronomy)

Semester	Course Type	Course Code	Course Name	Credits
Semester I	CORE COURSE - 1	MSC-AGRON-101	Modern Concepts in Crop Production	4
	CORE COURSE - 2	MSC-AGRON-102	Principles and Practices of Weed Management	4
	CORE COURSE - 3	MSC-AGRON-103	Soil Fertility and Fertilizer Use	4
	CORE COURSE - 4	MSC-AGRON-104	Intellectual Property and its management in Agriculture	4
	SEMINAR	MSC-AGRON-105	Seminar-I	2
	PRACTICAL COURSE -1	MSC-AGRON-102-P	Principles and Practices of Weed Management Practical	2
	PRACTICAL COURSE - 2	MSC-AGRON-103-P	Soil Fertility and Fertilizer Use Practical	2
	PRACTICAL COURSE - 3	MSC-AGRON-105-P	Library and Information Services Practical	2
	PRACTICAL COURSE - 3	MSC-AGRON-106-P	Basic Concepts in Laboratory Techniques	2
Semester II	CORE COURSE - 5	MSC-AGRON-201	Principles and Practices of Water Management	4
	CORE COURSE - 6	MSC-AGRON-202	Agronomy of Major Cereals and Pulses	4
	CORE COURSE -7	MSC-AGRON-203	Agronomy of Oilseed, Fibre and Sugar Crops	4
	CORE COURSE - 8	MSC-AGRON-204	Agricultural Research, Research Ethics and Rural Development Programmes	4
	PRACTICAL COURSE -1	MSC-AGRON-201-P	Principles and Practices of Water Management Practical	2
	PRACTICAL COURSE - 2	MSC-AGRON-203-P	Agronomy of Oilseed, Fiber and Sugar Crops Practical	2
	PRACTICAL COURSE - 3	MSC-AGRON-205-P	Technical Writing and Communications Skills	4
	CHM			2
	CORE COURSE - 9	MSC-AGRON-301	Agronomy of Fodder and Forage Crops	4

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Semester III	CORE COURSE - 10	MSC-AGRON-302	Agrostology and Agro-forestry	4
	DISCIPLINE ELECTIVE COURSE -1	MSC-AGRON-303 A	Experimental Designs	4
		MSC-AGRON-303 B	Statistical Methods for Applied Sciences	
		MSC-AGRON-303 C	Sampling Techniques	
		MSC-AGRON-303 D	Data Analysis Using Statistical Packages	
	DISCIPLINE ELECTIVE COURSE -2	MSC-AGRON-304 A	Basic Sampling Techniques	4
		MSC-AGRON-304 B	Principles and Practices of Organic Farming	
		MSC-AGRON-304 C	Basic Biochemistry	
		MSC-AGRON-304 D	Techniques in Biochemistry	
	PRACTICAL COURSE -5	MSC-AGRON-301-P	Agronomy of Fodder and Forage Crops Practical	4
	PRACTICAL COURSE -6	MSC-AGRON-302-P	Agrostology and Agro-forestry Practical	4
	OEC TO BE SELECTED FROM THE BUCKET OF COURSES	MSC-AGRON-305 A	Dry Land Farming	2
		MSC-AGRON-305 B	Management of Problem soils	
		MSC-AGRON-305 C	Farming Systems	
Semester IV	CORE COURSE - 11	MSC-AGRON-401	Soil mineralogy, genesis and classification	4
	DISCIPLINE ELECTIVE COURSE - 3	MSC-AGRON-402 A	Soil, water and air pollution	4
		MSC-AGRON-402 B	Crop Ecology and Agro Meteorology	
		MSC-AGRON-402 C	Agronomy of Medicinal and Aromatic Crops	
		MSC-AGRON-402 D	Current Trends in Agronomy	
	DISCIPLINE ELECTIVE COURSE - 4	MSC-AGRON-403 A	Agronomy of Pulses and oil Seed Crops	4
		MSC-AGRON-403 B	Advances in Soil fertility and Nutrient Management	
		MSC-AGRON-403 C	Cropping System and Sustainable Agriculture	
		MSC-AGRON-403 D	Applied Regression Analysis	
	DISSERTATION		Project	12

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	EEC	MSC-AGRON-404 A	Seed Production Technology of Field Crops	2
		MSC-AGRON-404 B	Soil Conservation and watershed Management	
		MSC-AGRON-404 C	Agronomy of Fodder and Pasture crops	

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SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Agriculture

Course Name -M.Sc. Agriculture (Specialization in Agronomy)

Batch:2025-26							SEM:I						
S.No.	Course Type	Course Code	Course Name	Teaching Load			Credits	Internal Assessment				External Assessment	Total
				L	T	P							
THEORY and PRACTICAL SUBJECTS								CLASS PARTICIPATION	Quiz/PPT/Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)	
1	CORE COURSE-1	MSC-AGRON-101	Modern Concepts in Crop Production	4	1	0	4	5	10	15	30	70	100
2	CORE COURSE-2	MSC-AGRON-102	Principles and Practices of Weed Management	4	1	0	4	5	10	15	30	70	100
3	CORE COURSE-3	MSC-AGRON-103	Soil Fertility and Fertilizer Use	4	1	0	4	5	10	15	30	70	100
4	CORE COURSE-4	MSC-AGRON-104	Intellectual Property and its management in Agriculture	4	1	0	4	5	10	15	30	70	100
5	PRACTICAL COURSE-1	MSC-AGRON-102-P	Principles and Practices of Weed Management Practical	0	0	4	2	5	10	15	30	70	100
6	PRACTICAL COURSE-2	MSC-AGRON-103-P	Soil Fertility and Fertilizer Use Practical	0	0	4	2	5	10	15	30	70	100
7	PRACTICAL COURSE-3	MSC-AGRON-105-P	Library and Information Services Practical	0	0	4	2	5	10	15	30	70	100
8	PRACTICAL COURSE-4	MSC-AGRON-106-P	Basic Concepts in Laboratory Techniques	0	0	4	2	5	10	15	30	70	100
9	SEMINAR	MSC-AGRON-105		0	0	4	2	4	4	7	15	35	50
TOTAL CREDITS / ASSESSMENT							26	44	84	127	255	595	850

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Department of Agriculture														
Course Name -M.Sc. Agriculture (Specialization in Agronomy)														
Batch:2025-26							**SEM:II**							
S.No.	**Course Type**	**Course Code**	**Course Name**	**Teaching Load**			**Credits**	**Internal Assessment**				**External Assessment**	**Total**
				L	**T**	**P**							
THEORY and PRACTICAL SUBJECTS								**CLASS PARTICIPATION**	**Quiz/PPT/Assignment (10)**	**Mid Sem Test (15)**	**TOTAL**	**End Sem Exam (70)**	
1	CORE COURSE-5	MSC-AGRON-201	Principles and Practices of Water Management	4	1	0	4	5	10	15	30	70	100
2	CORE COURSE-6	MSC-AGRON-202	Agronomy of Major Cereals and Pulses	4	1	0	4	5	10	15	30	70	100
3	CORE COURSE-7	MSC-AGRON-203	Agronomy of Oilseed, Fibre and Sugar Crops	4	1	0	4	5	10	15	30	70	100
4	CORE COURSE-8	MSC-AGRON-204	Agricultural Research, Research Ethics and Rural Development Programmes	4	1	0	4	5	10	15	30	70	100
5	PRACTICAL COURSE-3	MSC-AGRON-201-P	Principles and Practices of Water Management Practical	0	0	4	2	5	10	15	30	70	100
6	PRACTICAL COURSE-4	MSC-AGRON-203-P	Agronomy of Oilseed, Fiber and Sugar Crops Practical	0	0	4	2	5	10	15	30	70	100
7	PRACTICAL COURSE-5	MSC-AGRON-205-P	Technical Writing and Communications Skills	0	0	8	4	5	10	15	30	70	100
8	CHM	CHM-01		2	1	0	2	4	4	7	15	35	50
TOTAL CREDITS / ASSESSMENT							**26**	39	74	112	225	525	**750**

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Course Title : **Modern Concepts in Crop Production**

Course Code : **MSC-AGRON-101**

Aim of the course

To teach the basic concepts of soil management and crop production.

Theory

Unit I

Crop growth analysis in relation to environment; geo-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, use of growth hormones and regulators for better adaptation in stressed condition.

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.Modern crop production concepts: soil less cultivation, Aeroponic, Hydroponic, Robotic and terrace farming. use of GIS, GPS and remote sensing in modern agriculture, precision farming and protected agriculture.

Teaching methods/activities

Classroom teaching with AV aids, group discussion, assignment and class discussion

Learning outcome

Basic knowledge on soil management and crop production

Suggested Reading

- Balasubramaniyan P and Palaniappan SP. 2001. *Principles and Practices of Agronomy*. Agrobios.
- Fageria NK. 1992. *Maximizing Crop Yields*. Marcel Dekker.
- Havlin JL, Beaton JD, Tisdale SL and 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 and Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing & Publ.
- Singh SS. 2006. *Principles and Practices of Agronomy*. Kalyani.
- Alvin PT and kozlowski TT (ed.). 1976. *Ecophysiology of Tropical Crops*. Academia Pul., New York.
- Gardner PP, Pearce GR and Mitchell RL. 1985. *Physiology of Crop Plants*. Scientific Pub. Jodhpur.

Course Title : Principles and Practices of Weed Management

Course Code : MSC-AGRON-102

Aim of the course

To familiarize the students about the weeds, herbicides and methods of weed control.

Theory

Weed biology, and ecology and classification, crop-weed competition including allelopathy; principles and methods of weed control and classification management; weed indices, weed shift in different eco-systems

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, sequential application of herbicides, rotation; weed control through use ofnano-herbicides and bio-herbicides, myco-herbicides bio-agents, and allelochemicals; movement of herbicides in soil and plant, Degradation of herbicides in soil and plants; herbicide resistance, residue, persistence and management; development of herbicide resistance in weeds and crops and their management, herbicide combinationand rotation.

Unit IV

Weed management in major crops and cropping systems; alien, invasive and parasitic weeds and their management; weed shifts in cropping systems; aquatic and perennialweed control; weed control in non-crop area.

Unit V

Integrated weed management; recent development in weed management- robotics, use of drones and aeroplanes, organic etc., cost: benefit analysis of weed management.

Practical

- Identification of important weeds of different crops
- Preparation of a weed herbarium
- Weed survey in crops and cropping systems
- Crop-weed competition studies
- Weed indices calculation and interpretation with data
- Preparation of spray solutions of herbicides for high and low-volume sprayers
- Use of various types of spray pumps and nozzles and calculation of swath width
- Economics of weed control, Herbicide resistance analysis in plant and soil
- Bioassay of herbicide resistance residues
- Calculation of herbicidal herbicide requirement

Learning outcome

Basic knowledge on weed identification and control for crop production

Suggested Reading

- Böger, Peter, Wakabayashi, Ko, Hirai, Kenji (Eds.). 2002. *Herbicide Classes in Development*. *Mode of Action, Targets, Genetic Engineering, Chemistry*. Springer.
- Chauhan B and Mahajan G. 2014. *Recent Advances in Weed Management*. Springer.

Course Title : Soil Fertility and Fertilizer Use

Course Code : MSC-AGRON-103

Aim of the course

To impart knowledge about soil fertility and its control, and to understand the role of fertilizers and manures in supplying nutrients to plants so as to achieve high fertilizer use efficiency.

Theory

Unit I

Soil fertility and soil productivity; fertility status of major soils group of India; nutrient sources – fertilizers and manures; Criteria of essentiality, classification, law of minimum and maximum, essential plant nutrients - functions and deficiency symptoms, Nutrient uptake, nutrient interactions in soils and plants; long term effect of manures and fertilizers on soil fertility and crop productivity.

Unit II

Soil and fertilizer nitrogen – sources, forms, immobilization and mineralization, nitrification, denitrification; biological nitrogen fixation -types, mechanism, microorganisms and factors affecting; nitrogenous fertilizers and their fate in soils; management of fertilizer nitrogen in lowland and upland conditions for high fertilizer use efficiency.

Unit III

Soil and fertilizer phosphorus - forms, immobilization, mineralization, reactions in acid andalkali soils; factors affecting phosphorus availability in soils; phosphatic fertilizers - behavior in soilsand management under field conditions. Potassium - forms, equilibrium in soils and its agriculturalsignificance; mechanism of potassium fixation; management of potassium fertilizers under fieldconditions.

Unit V

Sulphur - source, forms, fertilizers and their behavior in soils; roleincropsandhuman health; calcium and magnesium– factors affecting their availability in soils; management of sulphur, calcium and magnesium fertilizers.

Unit VI

Micronutrients – critical limits in soils and plants; factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability.

Unit VII

Common soil test methods for fertilizer recommendations; quantity–intensityrelationships; soil test crop response correlations and response functions.

Unit VIII

Fertilizer use efficiency; site-specific nutrient management; plant need based nutrient management; integrated nutrient management; specialityfertilizersconcept, needand category.CurrentstatusofspecialityfertilizersuseinsoilsandcropsofIndia;

Unit IX

Soil fertility evaluation - biological methods, soil, plant and tissue tests; soilquality in relation to sustainable agriculture, Determination of critical limit, DRIS

Unit X

Definition and concepts of soil health and soil quality; Longterm effects of fertilizers and soil quality.

Practical

- Soil and plant sampling and processing for chemical analysis
- Determination of soil pH, total and organic carbon in soil
- Chemical analysis of soil for total and available nutrients(major and micro)
- Analysis of plants for essential elements(major and micro)

Suggested Reading

- Brady NC and Weil RR. 2002. *The Nature and Properties of Soils*. 13th Ed. Pearson Edu.
- Kabata-Pendias A and Pendias H. 1992. *Trace Elements in Soils and Plants*. CRC Press.
- Kannaiyan S, Kumar K and Govindarajan K. 2004. *Biofertilizers Technology*. Scientific Publ.
- Leigh J G. 2002. *Nitrogen Fixation at the Millennium*. Elsevier.
- Mengel K and Kirkby EA. 1982. *Principles of Plant Nutrition*. International Potash Institute, Switzerland.

Course Title : Intellectual Property and Its Management In Agriculture

Course Code : MSC-AGRON-104

Objective

The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy.

Theory

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Readings

1. Erbisch FH and Maredia K.1998. *Intellectual Property Rights in Agricultural Biotechnology*. CABI.
2. Ganguli P. 2001. *Intellectual Property Rights: Unleashing Knowledge Economy*. McGraw-Hill.
3. *Intellectual Property Rights: Key to New Wealth Generation*. 2001. NRDC and Aesthetic Technologies.

Course Title : Library And Information Services
Course Code : MSC-AGRON-105-P

Objective

To equip the library users with skills to trace information from libraries efficiently, to apprise them of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines, etc.) of information search.

Practical

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/ Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e- resources access methods.

Course Title :Basic Concepts In Laboratory Techniques
Course Code : MSC-AGRON-106-P

Objective

To acquaint the students about the basics of commonly used techniques in laboratory.

Practical

- Safety measures while in Lab;
- Handling of chemical substances;
- Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets;
- Washing, drying and sterilization of glassware;
- Drying of solvents/ chemicals;
- Weighing and preparation of solutions of different strengths and their dilution;
- Handling techniques of solutions;
- Preparation of different agro-chemical doses in field and pot applications;
- Preparation of solutions of acids;
- Neutralisation of acid and bases;
- Preparation of buffers of different strengths and pH values;
- Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath;
- Electric wiring and earthing;
- Preparation of media and methods of sterilization;
- Seed viability testing, testing of pollen viability;
- Tissue culture of crop plants;
- Description of flowering plants in botanical terms in relation to taXonomy.

Suggested Readings

1. Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press.
2. Gabb MH and Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.

1st year 2nd Semester

Course Title: Principles and Practices of Water Management

Course Code: MSC-AGRON-201

Aim of the course

To teach the principles of water management and practices to enhance the water productivity

Theory

Unit I

Water and its role in plants; Irrigation: Definition and objectives, water resources and irrigation development in of India and concerned state, major irrigation projects, extent of area and crops irrigated in India and in different states.

Unit II

Field water cycle, water movement in soil and plants; transpiration; soil-water- plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition. Water availability and its relationship with nutrient availability and loses.

Unit III

Soil, plant and meteorological factors determining water needs of crops, scheduling, depth and methods of irrigation; micro irrigation systems; deficit irrigation; fertigation; management of water in controlled environments and polyhouses. Irrigation efficiency and water use efficiency.

Unit IV

Water management of crop and cropping system, Quality of irrigation water and management of saline water for irrigation, water use efficiency, Crop water requirement- estimation of ET and effective rainfall; Water management of the major crops and cropping systems. Automated irrigation system.

Unit V

Excess of soil water and plant growth; water management in problem soils, drainage requirement of crops and methods of field drainage, their layout and spacing; rain water management and its utilization for crop production.

Unit VI

Quality of irrigation water and management of saline water for irrigation, water management in problem soils

Unit VII

Soil moisture conservation, water harvesting, rain water management and its utilization for crop production.

Unit VIII

Hydroponics,

Unit IX

Water management of crops under climate change scenario.

Practical

- Determination of Field capacity by field method
- Determination of Permanent Wilting Point by sunflower pot culture technique
- Determination of Field capacity and Permanent Wilting Point by Pressure Plate Apparatus
- Determination of Hygroscopic Coefficient
- Determination of maximum water holding capacity of soil
- Measurement of matric potential using gauge and mercury type tensiometer
- Determination of soil-moisture characteristics curves
- Determination of saturated hydraulic conductivity by constant and falling head method
- Determination of hydraulic conductivity of saturated soil below the water table by auger hole method
- Measurement of soil water diffusivity
- Estimation of unsaturated hydraulic conductivity
- Estimation of upward flux of water using tensiometer and from depth ground water table
- Determination of irrigation requirement of crops (calculations)
- Determination of effective rainfall (calculations)
- Determination of ET of crops by soil moisture depletion method16. Determination of water requirements of crops
- Measurement of irrigation water by volume and velocity-area method
- Measurement of irrigation water by measuring devices and calculation of irrigation efficiency
- Determination of infiltration rate by double ring infiltrometer

Learning outcome

Basic knowledge on water management for optimization of crop yield

Suggested Reading

- Majumdar DK. 2014. *Irrigation Water Management: Principles and*

Practice. PHL Learning private publishers

- Mukund Joshi. 2013. *A Text Book of Irrigation and Water Management Hardcover*, Kalyani publishers
- 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 and Sandhu BS. 1987. *Irrigation of Food Crops - Principles and Practices*. ICAR.
- Reddy SR. 2000. *Principles of Crop Production*. Kalyani.
- Singh Pratap and Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publ.

Course Title: Agronomy of Major Cereals and Pulses

Course Code: MSC-AGRON-202

Aim of the course

To impart knowledge of crop husbandry of cereals and pulse crops.

Theory

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of:

Unit I: *Rabi* cereals. **Unit II:** *Kharif* cereals. **Unit III:** *Rabi* pulses. **Unit IV:** *Kharif* pulses.

- Phenological studies at different growth stages of crop
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Working out growth indices (CGR, RGR, NAR, LAI, LAD, LAR, LWR, SLA, SLW etc)
- Assessment of land use and yield advantage (Rotational intensity, Cropping intensity, Diversity Index, Sustainable Yield Index Crop Equivalent Yield, Land Equivalent ration, Aggressiveness, Relative Crowding Coefficient, Competition Ratio and ATER etc)
- Estimation of protein content in pulses
- Planning and layout of field experiments
- Judging of physiological maturity in different crops
- Intercultural operations in different crops
- Determination of cost of cultivation of different crops
- Working out harvest index of various crops
- Study of seed production techniques in selected crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

Learning outcome

Basic knowledge on cereals and pulse growing in the country .

Resources

- Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

- Hunsigi G and Krishna KR. 1998. *Science of Field Crop Production*. Oxford & IBH.
- Jeswani LM and Baldev B. 1997. *Advances in Pulse Production Technology*.ICAR.
- Khare D and Bhale MS. 2000. *Seed Technology*. Scientific Publ.
- Kumar Ranjeet and Singh NP. 2003. *Maize Production in India: Golden Grain in Transition.*IARI, New Delhi.
- Pal M, Deka J and Rai RK. 1996. *Fundamentals of Cereal Crop Production*.Tata McGraw

Course Title: Agronomy of Oilseed, Fibre and Sugar Crops

Course Code: MSC-AGRON-203

Aim of the course

To teach the crop husbandry of oilseed, fiber and sugar crops

Theory

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality component, handling and processing of the produce for maximum production of:

Unit I

Rabi oilseeds – Rapeseed and mustard, Linseed and Niger

Unit II

Kharif oilseeds - Groundnut, Sesame, Castor, Sunflower, Soybean and Safflower

Unit III

Fiber crops - Cotton, Jute, Ramie and Mesta.

Unit IV

Sugar crops – Sugar-beet and Sugarcane.

I. Practical

- Planning and layout of field experiments
- Cutting of sugarcane setts, its treatment and methods of sowing, tying and propping of sugarcane
- Determination of cane maturity and calculation on purity percentage, recovery percentage and sucrose content in cane juice phenological studies at different growth stages of crop
- Intercultural operations in different crops
- Cotton seed treatment
- Working out growth indices (CGR, RGR, NAR, LAI, LAD, LAR, LWR, SLA, SLW etc)
- Assessment of land use and yield advantage (Rotational intensity, Cropping intensity, Diversity Index, Sustainable Yield Index Crop Equivalent Yield, Land Equivalent ration, Aggressiveness, Relative Crowding Coefficient, Competition Ratio and ATER etc)
- Judging of physiological maturity in different crops and working out harvest index
- Working out cost of cultivation of different crops
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping

and rotational intensities

- Determination of oil content in oilseeds and computation of oil yield
- Estimation of quality of fibre of different fibre crops
- Study of seed production techniques in various crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

Learning outcome

Basic knowledge on production of oil seed, sugar and fibre crops.

Suggested Reading

- Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.
- Das PC. 1997. *Oilseed Crops of India*. Kalyani.
- Lakshmikantam N. 1983. *Technology in Sugarcane Growing*. 2nd Ed. Oxford & IBH.

Course Title : Agricultural Research, Research Ethics And Rural Development Programmes

Course Code : MSC-AGRON-204

Objective

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.

Theory

UNIT I History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility.

UNIT II Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

UNIT III Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/ Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

Suggested Readings

1. Bhalla GS and Singh G. 2001. *Indian Agriculture - Four Decades of Development.* Sage Publ.
2. Punia MS. *Manual on International Research and Research Ethics.* CCS Haryana Agricultural University, Hisar.
3. Rao BSV. 2007. *Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives*. Mittal Publ.
4. Singh K. 1998. *Rural Development - Principles, Policies and*

Course Name : Technical Writing And Communications Skills

Course Code: MSC-AGRON-205-P

Objective

To equip the students/ scholars with skills to write dissertations, research papers, etc. To equip the students/ scholars with skills to communicate and articulate in English (verbal as well as writing).

Practical (Technical Writing)

- Various forms of scientific writings- theses, technical papers, reviews, manuals, etc.;
- Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion);
- Writing of abstracts, summaries, précis, citations, etc.;
- Commonly used abbreviations in the theses and research communications;
- Illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations;
- Writing of numbers and dates in scientific write-ups;
- Editing and proof-reading;
- Writing of a review article;
- Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks);
- Error analysis (Common errors), Concord, Collocation, Phonetic symbols and transcription;
- Accentual pattern: Weak forms in connected speech;
- Participation in group discussion;
- Facing an interview;
- Presentation of scientific papers.

Suggested Readings

1. Barnes and Noble. Robert C. (Ed.). 2005. *Spoken English: Flourish Your Language*.
2. *Chicago Manual of Style*. 14th Ed. 1996. Prentice Hall of India.
3. *Collins' Cobuild English Dictionary*. 1995.
4. Harper Collins. Gordon HM and Walter JA. 1970. *Technical Writing*. 3rd Ed.
5. Holt, Rinehart and Winston. Hornby AS. 2000. *Comp. Oxford Advanced Learner's Dictionary of Current English*. 6th Ed. Oxford University Press.
6. James HS. 1994. *Handbook for Technical Writing*. NTC Business Books.
7. Joseph G. 2000. *MLA Handbook for Writers of Research Papers*. 5th Ed. Affiliated

East-West Press.
8. Mohan K. 2005. *Speaking English Effectively*. MacMillan India.
9. Richard WS. 1969. *Technical Writing*.
10. Sethi J and Dhamija PV. 2004. *Course in Phonetics and Spoken English*. 2nd Ed. Prentice Hall of India.
11. Wren PC and Martin H. 2006. *High School English Grammar and Composition*.

Department of Agriculture													
Course Name -M.Sc. Agriculture (Specialization in Agronomy)													
Batch:2025-26							**SEM:III**						
S.No.	**Course Type**	**Course Code**	**Course Name**	**Teaching Load**			**Credits**	**Internal Assessment**				**External Assessment**	**Total**
				L	**T**	**P**							
THEORY and PRACTICAL SUBJECTS								**CLASS PARTICIPATION**	**Quiz/PPT/Assignment (10)**	**Mid Sem Test (15)**	**TOTAL**	**End Sem Exam (70)**	
1	CORE COURSE-9	MSC-AGRON-301	Agronomy of Fodder and Forage Crops	4	1	0	4	5	10	15	30	70	100
2	CORE COURSE-10	MSC-AGRON-302	Agrostology and Agro-forestry	4	1	0	4	5	10	15	30	70	100
3	DISCIPLINE ELECTIVE COURSE -1	DES-01	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100
4	DISCIPLINE ELECTIVE COURSE -1	DES-02	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100
5	PRACTICAL COURSE-9	MSC-AGRON-301-P	Agronomy of Fodder and Forage Crops	0	0	8	4	5	10	15	30	70	100

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			Practical										
6	PRACTICAL COURSE-10	MSC-AGRON-302-P	Agrostology and Agro-forestry Practical	0	0	8	4	5	10	15	30	70	100
7	OEC	OEC-1	To Be selcted from the Bucket of Courses	2	1	0	2	4	4	7	15	35	50
TOTAL CREDITS / ASSESSMENT							**26**	34	64	97	195	455	**650**

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Department of Agriculture													
Course Name -M.Sc. Agriculture (Specialization in Agronomy)													
Batch:2025-26							SEM:IV						
S. No.	Course Type	Course Code	Course Name	Teaching Load			Credits	Internal Assessment				External Assessment	Total
				L	T	P							
THEORY and PRACTICAL SUBJECTS								CLASS PARTICIPATION	Quiz/ PPT/ Assignment (10)	Mid Sem Test (15)	TOTAL	End Sem Exam (70)	
1	CORE COURSE-11	MSC-AGRON401	Soil mineralogy, genesis and classification	4	1	0	4	5	10	15	30	70	100
3	DISCIPLINE ELECTIVE COURSE -3	DEC-3'	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100
4	DISCIPLINE ELECTIVE COURSE -4	DEC-4'	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100
5	DISSERTATION	PC-1		4	0	8	12	20	30	50	100	200	300
7	EEC	EEC-1	To Be selcted from	0	0	0	2	4	4	7	15	35	50

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			the Bucket of Courses										
TOTAL CREDITS / ASSESSMENT							26	39	64	102	205	445	650

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Course Title : Agronomy of Fodder and Forage Crops

Course Code : MSC-AGRON-301

Aim of the course

To teach the crop husbandry of different forage and fodder crops along with their processing.

Theory

Unit I

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important fodder crops like sorghum, maize, *bajra*, *guar*, cowpea, oats, barley, berseem, *senji*, lucerne, etc.

Unit II

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasseslime, Napier grass, *Panicum, Lasiuras, Cenchrus,* etc.

Unit III

Year-round fodder production and management, preservation and utilization of forage and pasture crops.

Unit IV

Principles and methods of hay and silage making; chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage; use of physical and chemical enrichments and biological methods for improving nutrition; value addition of poorquality fodder. Fodder production through hydroponics. Azolla cultivation.

Unit V

Economics of forage cultivation uses and seed production techniques of important fodder crops.

Practical

- Practical training of farm operations in raising fodder crops;
- Canopy measurement, yield, Leaf: Stem ratio and quality estimation, viz. crude protein, NDF, ADF, lignin, silica, cellulose and IVDMD, etc. of various fodder and forage crops
- Anti-quality components like HCN in sorghum and such factors in other crops

Learning outcome

Acquainted with various fodder and forage crops and their commercial base for developing entrepreneurship.

Suggested Reading

- Chatterjee BN. 1989. *Forage Crop Production - Principles and Practices*. Oxford & IBH.
- Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.
- Narayanan TR and Dabadghao PM. 1972. *Forage Crops of India*. ICAR.

Course Title: Agrostology and Agro-forestry

Course Code: MSC-AGRON-302

Aim of the course

To teach crop husbandry of different forage, fodder and agroforestry crops/trees along with their processing.

Theory

Unit I

Agrostology: definition and importance; principles of grassland ecology: grassland ecology – community, climax, dominant species, succession, biotype, ecological status of grasslands in India, grass cover of India; problems and management of grasslands.

Unit II

Importance, classification (various criteria), scope, status and research needs of pastures; pasture establishment, their improvement and renovation-natural pastures, cultivated pastures; common pasture grasses.

Unit III

Agroforestry: definition and importance; agroforestory systems, agrisilviculture, silvipasture, agrisilvipasture, agrihorticulture, aquasilviculture, alley cropping and energy plantation.

Unit IV

Crop production technology in agro-forestory and agrostology system; silvipastoral system: meaning and importance for wasteland development; selection of species, planting methods and problems of seed germination in agro-forestry systems; irrigation and manuring in agro-forestry systems, associative influence in relation to above ground and underground interferences; lopping and coppicing in agro-forestry systems; social acceptability and economic viability, nutritive value of trees; tender operation; desirable tree characteristics.

Practical

- Preparation of charts and maps of India showing different types of pastures and agro-forestry systems
- Identification of seeds and plants of common grasses, legumes and trees of economic importance with reference to agro-forestry
- Seed treatment for better germination of farm vegetation
- Methods of propagation/ planting of grasses and trees in silvipastoral system
- Fertilizer application in strip and silvipastroal systems
- After-care of plantation

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- Estimation of protein content in loppings of important fodder trees
- Estimation of calorie value of wood of important fuel trees
- Estimation of total biomass and fuel wood
- Economics of agro-forestry
- Visit to important agro-forestry research stations

Learning outcome

Basic knowledge on agro forestry, forage crops and their utility

Suggested Reading

- Chatterjee BN and Das PK. 1989. *Forage Crop Production. Principles and Practices.* Oxford & IBH.
- Dabadghao PM and Shankaranarayan KA. 1973. *The Grass Cover in India*. ICAR.

Course Title: Experimental Designs

Course Code: MSC-AGRON-303-A

Aim of the course

This course is meant for students of agricultural and animal sciences other than Agricultural Statistics. Designing an experiment is an integrated component of research in almost all sciences. The students would be exposed to concepts of Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.

Theory

Unit I

Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control.

Unit II

Uniformity trials, size and shape of plots and blocks, Analysis of variance, Completelyrandomized design, randomized block design and Latin square design.

Unit III

Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom. Concept of confounding.

Unit IV

Split plot and strip plot designs, analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, Balanced Incomplete Block Design, resolvable designs and their applications, Lattice design, alpha design - concepts, randomization procedure, analysis and interpretation of results. Response surfaces. Combined analysis.

Practical

- Uniformity trial data analysis, formation of plots and blocks, Fairfield Smith Law, Analysis of data obtained from CRD, RBD, LSD, Analysis of factorial experiments,
- Analysis with missing data,
- Split plot and strip plot designs.

Suggested Reading

- Cochran WG and Cox GM. 1957. *Experimental Designs*. 2nd Ed. John Wiley.
- Dean AM and Voss D. 1999. *Design and Analysis of Experiments*. Springer.
- Montgomery DC. 2012. *Design and Analysis of Experiments,* 8th Ed. John

Wiley.

- Federer WT. 1985. *Experimental Designs*. MacMillan.
- Fisher RA. 1953. *Design and Analysis of Experiments*. Oliver & Boyd.
- Nigam AK and Gupta VK. 1979. *Handbook on Analysis of Agricultural Experiments*. IASRI Publ.
- Pearce SC. 1983. *The Agricultural Field Experiment: A Statistical Examination of Theory and Practice*. John Wiley.
- www.drs.icar.gov.in.

Course Title : Statistical methods for Applied Sciences;

Course Code: MSC-AGRON-303-B

Unit-1

Classification, tabulation and graphical representation of data. Descriptive statistics. Exploratory data analysis; Theory of probability. Random variable and mathematical expectation. Discrete and continuous probability distributions: Binomial, Poisson, Negative Binomial, Normal distribution and their applications. Concept of sampling distribution: chi-square, t and F distributions. Tests of significance based on Normal, chi-square, t and F distributions. Large sample theory.

Unit-2

Introduction to theory of estimation and confidence-intervals. Correlation and regression. Simple and multiple linear regressionmodel, estimation of parameters, predicted values and residuals, correlation, partial correlation coefficient, multiple correlation coefficient, rankcorrelation, test of significance of correlation coefficient and regression coefficients. Coefficient of determination.

Unit-3

Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and localcontrol. Uniformity trials, size and shape of plots and blocks; Analysis of variance; Completely randomized design, randomized block design and Latin square design.

Unit-4

Factorial experiments, (symmetrical as well as asymmetrical). Confounding in symmetrical factorial experiments, Factorial experiments with control treatment. Split plot and strip plot designs; Analysis of missing plot techniques in randomized block and Latin square designs.

Course Title : Sampling Techniques
Course Code : MSC-AGRON-303-C

Theory

Unit-1

Sample survey vs complete survey, probability sampling, sample space, sampling design, sampling strategy; Inverse sampling; Determination of sample size; Confidence-interval; Simple random sampling, Estimation of population proportion, Stratified random sampling, Number of strata and optimum points of stratification.

Unit-2

Ratio and regression methods of estimation, Cluster sampling, Systematic sampling, Multistage sampling with equal probability, Separate and combined ratio estimator, Double sampling, Successive sampling –two occasions.

Unit-3

Non-sampling errors – sources and classification, Non-response in surveys, Imputation methods, Randomized response techniques, Response errors – interpenetrating sub-sampling.

Unit-4

Sampling with varying probabilities with and without replacement, PPS sampling, Cumulative method and Lahiri's method of selection, Horvitz Thompson estimator, Ordered and unordered estimators, Sampling strategies due to Midzuno-Sen and Rao-Hartley-Cochran. Inclusion probability proportional to size sampling, PPS systematic sampling, Multistage sampling with unequal probabilities, Self weighting design PPS sampling.

Unit-5

Unbiased ratio and regression type estimators, Multivariate ratio and regression type of estimators, Design effect, Bernoulli and Poisson sampling.

Course Title : Data Analysis Using Statistical Packages

Course Code : MSC-AGRON-303-D

Objective: This course is meant for exposing the students in the usage of various statistical packages for analysis of data. It would provide the students an hands on experience in the analysis of their research data. This course is useful to all disciplines. Theory

UNIT I Use of Software packages for: Summarization and tabulation of data; Descriptive statistics; Graphical representation of data, Exploratory data analysis.

UNIT II Fitting and testing the goodness of fit of discrete and continuous probability distributions; Testing of hypothesis based on large sample test statistics; Testing of hypothesis using chisquare, t and F statistics.

UNIT III Concept of analysis of variance and covariance of data for single factor, multi-factor, one-way and multi-classified experiments, contrast analysis, multiple comparisons, Analyzing crossed and nested classified designs.

UNIT IV Analysis of mixed models; Estimation of variance components; Testing the significance of contrasts; Correlation and regression including multiple regression.

UNIT V Discriminant function; Factor analysis; Principal component analysis; Analysis of time series data, Fitting of non-linear models; Time series data; Spatial analysis; Neural networks.

Course Title: Basic Sampling Techniques

Course Code: MSC-AGRON-304-A

Aim of the course

This course is meant for students of agricultural and animal sciences other than Statistics. The students would be exposed to elementary sampling techniques. It would help them in understanding the concepts involved in planning and designing their surveys, presentation of survey data analysis of survey data and presentation of results. This course would be especially important to the students of social sciences.

Theory

Unit I

Concept of sampling, sample survey vs complete enumeration, planning of sample survey, sampling from a finite population.

Unit II

Simple random sampling with and without replacement, sampling for proportion, determination of sample size, inverse sampling, Stratified sampling.

Unit III

Cluster sampling, Multi-stage sampling, systematic sampling; Introduction to PPS sampling,

Unit IV

Use of auxiliary information at estimation, Ratio product and regression estimators. Double Sampling, sampling and non-sampling errors.

Suggested Reading

- Cochran WG. 1977. *Sampling Techniques*. John Wiley.
- Murthy MN. 1977. *Sampling Theory and Methods*. 2nd Ed. Statistical Publ. Soc., Calcutta.
- Singh D, Singh P and Kumar P. 1982. *Handbook on Sampling Methods*. IASRI Publ.

Course Title : Principles And Practices Of Organic Farming

Course Code : M.SC AGRON -304-B

UNIT - I Organic farming – definition – need – scope – principles – characteristics - relevance to modern agriculture. o Different eco friendly farming systems- biological farming, natural farming, regenerative agriculture – permaculture - biodynamic farming. o Relevance of organic farming to A.P, India, and global agriculture and future prospectsadvantages - barriers.

UNIT - II o Initiatives taken by the central and state governments, NGOs and other organizations for promotion of organic agriculture in India. o Organic nutrient sources and their fortification – organic manures- methods of composting o Green manures- bio fertilisers – types, methods of application – benefits and limitations.

UNIT - III Nutrient use in organic farming-scope and limitations. o Nutrient management in organic farming. oOrganic ecosystem and their concepts. o Choice of crops and varieties in organic farming – crop rotations – need and benefits – multiple cropping.

UNIT - IV Fundamentals of insect, disease and weed management under organic mode of production-cultural-biological methods-non chemical pest & disease management. o Botanicals-pyrethrum, neem seed kernel extract, neem seed powder, soluble neem formulations, neem oil. o Operational structure of NPOP – other agencies for organic production.

UNIT - V Inspection – certification - labelling and accreditation procedures for organic products. o Processing, - economic consideration and viability. o Marketing and export potential of organic products – national economy

Course Title : Basic Biochemistry

Course Code : **M.SC AGRON-304-C**

Objective: To provide elementary knowledge/overview of structure and functions and metabolism of biomolecules. Theory

UNIT I Scope and importance of biochemistry in agriculture; Fundamental principles governing life; structure of water; acid base concept and buffers; pH; hydrogen bonding; hydrophobic, electrostatic and Van der Waals forces; General introduction to physical techniques for determination of structure of biopolymers.

UNIT II Classification, structure and function of carbohydrates, lipids and biomembranes, amino acids, proteins, and nucleic acids.

UNIT III Structure and biological functions of vitamins, enzymes classification and mechanism of action; regulation, factors affecting enzyme action. Hormones animal plants and insects, Fundamentals of thermodynamic principles applicable to biological processes, Bioenergetics.

UNIT IV Metabolism of carbohydrates, photosynthesis and respiration, oxidative phosphorylation, lipids, proteins and nucleic acids. DNA replication, transcription and translation; recombinant DNA technology.

Course Title : Techniques In Biochemistry

Course code : M.SC AGRON-304-D

Unit – 1 Carbohydrates: Classification, Physicochemical properties; Chemistry, Biological roles and Structural elucidation of polysaccharides - homo and heteropolysaccharides, Peptidoglycans, Glycosaminoglycans; Glycoconjugates – Proteoglycans, Glycoproteins and Glycolipids; Oligosaccharides - Lectin interactions in biochemical processes

Unit – 2 Amino acids: Classification, Structure and Physicochemical properties; Peptide bond, Peptides of biological importance; Chemical synthesis of peptides – Solid phase peptide synthesis; Proteins – Classification, Isolation, Purification and Characterization of proteins, Criteria of homogeneity; Protein sequencing; Structural organization of Proteins – Ramachandran plots; Denaturation of proteins.

Unit – 3 Lipids: Classification; Structure, Properties and Biological roles of Phospholipids and Sphingolipids; Fatty acids and their physicochemical properties; Fats and Waxes - Physicochemical properties and characterization of fats and oils; Structure, Properties and functions of Eicosanoids - Prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes; Chemistry and Properties of Sterols and Steroids – Bile acids and Bile salts; Salient features of Bacterial and Plant lipids

Unit – 4 Nucleic acids: Bases, Nucleosides, Nucleotides; Nucleotides as Energy carriers, Enzyme cofactors and Chemical messengers; Synthetic nucleotide analogs; Chemical synthesis of oligonucleotides; Structure of DNA and different types of DNA, Supercoiled DNA; Structure of RNA and different types of RNA

Unit – 5 Physicochemical properties of Nucleic acids: Denaturation and Renaturation kinetics of nucleic acids - Melting temperature, Cot curves; Sequencing of Nucleic acids – Enzymatic and Chemical methods; Porphyrins – Structure and properties of Porphyrins –Heme, Chlorophylls, Bacteriochlorophylls and Cytochromes Reference books: 1. Text book of Biochemistry – E.S.West, W.R.Todd et al., 4 th ed 2. Principles of Biochemistry by Lehninger –D.L.Nelson, M.M.Cox7th ed

Course Title : Dry Land Farming

Course Code : M.SC AGRON-305-A

Unit I Definition, concept and characteristics of dryland farming, delineation of dryland areas, desertification, dryland versus rainfed farming, significance and dimensions of dryland farming in Indian agriculture, types of drought, constraints limiting crop production in dryland areas.

Unit II Problems in dry land agriculture. Moisture conservation practices and use of antitranspirants in dry land farming.

Unit III Concept of watershed management - constraints, approaches and components. Water harvesting - concept and techniques (indigenous and modern), improved agro-techniques, conservation tillage, seed hardening.

Unit IV Selection of suitable crops, crop rotations and crop mixtures for various categories of rain fed areas.

Course Title : Management of Problem Soils

Course code : M.SC AGRON-305-B

Theory

UNIT-1

Area and distribution of problems soils- acidic, saline, sodic and physically degraded soils; origin and basic concept of problematic soils, and factors responsible.

UNIT-2

Morphological features of saline, sodic and saline-sodic soils; characterization of salt-affected soils -soluble salts, ESP, pH; physical, chemical and microbiological properties.

UNIT-3

Management of salt effected soils; salt tolerance of crops -mechanism and ratings; monitoring of soils salinity in the field; management principles for sandy, clayey, red, lateritic and dry land soils. Acid soils -nature of soil acidity, sources of soil acidity; effect on plant growth, lime requirement of acid soils; management of acid soils; biological sickness of soils and it's management.

UNIT-4

Quality of irrigation water; management of brackish water for irrigation; salt balance under irrigation; characterization of brackish waters, area and extent; relationship in water use and quality.

UNIT-5

Agronomic practices in relation to problematic soils; cropping pattern for utilizing poor quality ground waters.

Course Title : Farming Systems

Course Code : M.SC AGRON-305-C

Theory :

Unit - I: Cropping System Cropping systems - Definition - Principles - Concepts - Classification - mono cropping - intensive cropping - cropping systems of India and Tamil Nadu - Interaction between different cropping systems - Cropping system management - Resource management - land, nutrient, water and weed.

Unit - II: Evaluation of Cropping System Index for evaluation of cropping systems - Land use - yield advantages - Economic evaluation - sustainability.

Unit - III: Farming System Farming systems - Definition - Principles - Concepts - Enterprises selection and management - interaction between different enterprises with cropping - scope and advantages of Integrated Farming system - Integrated farming system models for different agro eco-systems - interaction between enterprises.

Unit - IV: Evaluation of Farming System Resource recycling in IFS - Evaluation indicators of integrated farming system - LEISA & HEIA - concepts and principles - Conservation agriculture - principles, concept and scope.

Unit - V: Resource and labour management in farming system Resource management under constraint situation - Cost reduction strategies in crop production - Non-monetary inputs and low cost technologies - Labour management - farming system and environment.

Course Title: Soil Mineralogy, Genesis and Classification

Course Code: MSC-AGRON-401

Aim of the course

To acquaint students with basic structure of alumino-silicate minerals and genesis of clay minerals; soil genesis interms of factors and processes of soil formation, and to enable students conduct soil survey and interpret soil survey reports in terms of land use planning.

Theory

Unit I

Fundamentals of crystallography, space lattice, coordination theory, isomorphism and polymorphism.

Unit II

Classification, structure, chemical composition and properties of clay minerals; genesis and transformation of crystal line and non-crystal line clay minerals; identification techniques; amorphous soil constituents and other non-crystalline silicate minerals and their identification; clay minerals in Indian soils, role of clay minerals in plant nutrition, interaction of clay with humus, pesticides and heavy metals.

Unit III

Factors of soil formation, soil formation models; soil forming processes; weathering of rocks and mineral transformations; soil profile; weathering sequences of minerals with special reference to Indian soils.

Unit IV

Concept of soil individual; soil classification systems – historical developments and modern systems of soil classification with special emphasis on soil taxonomy; soil classification, soil mineralogy and soil maps – usefulness.

Course Title: Soil, Water and Air Pollution

Course Code: MSC-AGRON-402-A

Aim of the course

To make the student saw are of the problems of soil, water and air pollution associated with use of soils for crop production.

Theory Unit I

Soil, water and air pollution problems associated with agriculture, nature and extent.

Unit II

Nature and sources of pollutants – agricultural, industrial, urban wastes, fertilizers and pesticides, acid rains, oil spills etc.; air, water and soil pollutants- their CPC standards and effect on plants, animals and human beings.

Unit III

Sewage and industrial effluents–their composition and effecton soil properties/ health, and plant growth and humanbeings; soil as sink for waste disposal.

Unit IV

Pesticides–their classification, behaviour in soil and effecton soil microorganisms.

Unit V

Toxic elements–their sources, behaviour in soils, effect on nutrients availability, effect on plant and human health.

Unit VI

Pollution of water resources due to leaching of nutrients and pesticides from soil; emission of green house gases–carbondioxide, methane and nitrous oxide.

Unit VII

Risk assessment of polluted soil, Remediation/ amelioration of contaminated soil and water; remote sensing applications in monitoring and management of soil and water pollution.

Suggested Reading

- Lal R, Kimble J, Levine E and Stewart BA. 1995. *Soil Management and Greenhouse Effect.* CRC Press.
- Middlebrooks EJ. 1979. *Industrial Pollution Control*. Vol. I. *Agro-Industries*. John Wiley Interscience.
- Ross SM. *Toxic Metals in Soil Plant Systems*. John Wiley & Sons.
- Vesilund PA and Pierce 1983. *Environmental Pollution and Control*. Ann Arbor Science Publ.

Course Title : **Crop Ecologyandagrometeorology**

Course Code : M.SC AGRON-402-B

Theory

UNIT I Concept of crop ecology, ecosystem characteristics, energy flow in ecosystem, succession and climax concept, adaptation of crops, agro-ecologicalregions.

UNIT II Agrometeorology–aims, scope and development in relation to environment. Historical aspects of meteorology /climatology.

UNIT III Physiological response of crop plants to weather variables (light, temperature, CO2, moistureand solar radiation). Atmospheric pollution and its effect on climate. Global climate change and its impact onagriculture.

UNIT IV Monsoons – their origin and characteristics. Weather hazards and their mitigation. Artificial rain making. Weather forecasting in India–short, medium and long range. Remote sensing–aerospace science and weather forecasting. Benefits of weather services toagriculture.

Suggested Readings

Chadha, K.L. and Swaminathan, M.S. 2006. *Environment and Agriculture*. Malhotra Publ. House. Critchfield, H.J. 1995. *General Climatology*. Prentice Hall of India. Hemantarajan, A. 2007. *Environmental Physiology*. Scientific Publ.

Course Title : Agronomy of Medicinal and Aromatic crops
Course Code : M.SC. AGRON-402-C

Unit - I MAPs: definition, history, importance and future prospects. Medicinal Plants – past and present status in world and India. MAPs as industrial crops - constraints and remedial measures. Medicinal plant diversity & local healthcare. Medicinal plant conservation – issues and approaches. Medicinal plant conservation areas (MPCA), Non-timber forest products (NTFP), Good Agriculture Practices (GAP). Indian Himalayan region (IHR).
Unit - II Promotion of medicinal plant sector at national level: National Medicinal Plant Board and State Medicinal Plant Boards - objectives and functions. Other organizational initiatives for promotion of MAPs at National and International levels. Demand and supply of medicinal plants. Herbal industries.

Unit-III Important medicinal plants of India with their systematics, geographical distribution and uses. Acorus calamus, Adhatoda vasica, Abrus precatorius Aloe vera, Phyllanthus amarus, Stevia rebaudiana, Belladona and Cinchona.

Unit –IV Important aromatic plants of India with their systematics, geographical distribution and uses. Introduction and historical background of aromatic plants. Aromatic and cosmetic products. Raw material for perfumes etc. Cosmetic Industries. Major, minor and less known aromatic plants of India. Taxonomic descriptions and uses of important aromatic plants – citronella, davana, damask rose, geranium, khus grass, large cardamom, lavender, lemon grass, mentha, holy basil, patchouli, rosemary Palmarosa, vetiver, artemisia, eucalyptus, thyme, marjoram and oreganum. Aromatic spices - clove, cinnamon, nutmeg, ajwain, dill, celery, tamarind, garcinia, curryleaf and saffron.

Course Title : Current trends in Agronomy
Course Code : M.SC. AGRON-402-D

Theory Syllabus

Unit I Agro-physiological basis of variation in yield, recent advances in soil plant-water relationship.

Unit II Globalization of agriculture and WTO, precision agriculture, contract farming, organic farming, marketing and eXport potential of organic products, certification, labeling and accreditation procedures and ITK in organic farming.

Unit III Crop residue management in multiple cropping systems; latest developments in plant management: Mechanization in crop production: modern agricultural precisiontools and technologies, weed management, cropping systems, grassland management,agro-forestry, allelopathy.

Unit IV GIS, GPS and remote sensing for crop management, global warming, GM crops, seed production technology; seed certification, seed multiplication, hybrid seed production etc.

Unit V Concepts of system agriculture; holistic approach of farming systems, dryland farming, sustainable agriculture and research methodology in Agronomy. Conservation agriculture, principles, prospects and importance, potential benefitsof CA under climate change scenario, policy issues.

Course Title : **Agronomy of Pulses and oil seed Crops**
Course Code : M.SC. AGRON-403-A

UNIT I Role of pulse and oilseed crops in Indian agriculture. Causes of low yields of pulse and oilseed crops, and strategies for improving productivity.

UNIT II Origin, history, production trends, adaptability, classification, varietal improvement, climate and soil requirements, cultural, nutritional, weed and water management, quality components for maximum production of *kharif*pulses - pigeon pea, green gram, black gram, cowpea, moth bean, field bean.

UNIT III Origin, history, production trends, adaptability, classification, varietal improvement, climate and soil requirements, cultural, nutritional, weed and water management, quality components for maximum production of *rabbi* pulses – chickpea, lentil, peas, French bean.

UNIT IV Origin, history, production trends, adaptability, classification, varietal improvement, climate and soil requirements, cultural, nutritional, weed and water management, quality components for maximum production of *kharif* oil seeds - soybean, groundnut, sesamum and castor.

UNIT V Origin, history, production trends, adaptability, classification, varietal improvement, climate and soil requirements, cultural, nutritional, weed and water management, quality components for maximum production of *rabi* oil seeds – rape seed and mustard, sunflower, safflower, and linseed.

Suggested Readings

Ali, M., Singh, B.B., Shiv Kumar and Dhar, V. 2004. *Pulses in New Perspective*. Indian Society of Pulses Research and Development, Kanpur, India.

Course Title : Advances In Soil Fertility And Nutrient Management

Course Code : M.Sc AGRON-403-B

Theory

UNIT I Soil fertility and productivity, essential plant nutrients - criteria of essentiality, classification, functions, deficiency and toxicity symptoms, beneficial elements.

UNIT II Factor effecting of soil fertility, methods of fertilizer application and classification of fertilizer.

UNIT III Commercial fertilizers, new fertilizer materials and principles, fertilizer application and use efficiency, economics of fertilizer use, nutrient requirements of crops.

UNIT IV Preparation and use of FYM, compost, Green manures, Vermi compost, Bio fertilizer and other organic manure, Recycling of organic wastes .

UNIT V Nutrient function deficiency symptoms fertilizer mixture and grades, integrated nutrient management, Use of Vermi compost, Residual Management.

Suggested Readings

Brady, N.C. and Weil, R.R. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
Epestein, E. and Bloom, A. 2005. Mineral Nutrition of Plants: Principles and Perspectives. Second edition. Sinauer Associates.

Course Title : Cropping Systems And Sustainable Agriculture

Course Code : M.Sc AGRON-403-C

Theory

UNIT I Cropping systems: definition, indices and its importance; physical resources, soil and water management in cropping systems; assessment of land use.

UNIT II Concept of sustainability in cropping systems and farming systems, scope and objectives; production potential under monoculture cropping, multiple cropping, alley cropping, sequential cropping and intercropping, mechanism of yield advantage in intercropping systems.

UNIT III Above and below ground interactions and allelopathic effects; competition relations; multi-storied cropping and yield stability in intercropping, role of non-monetary inputs and low cost technologies; research need on sustainable agriculture.

UNIT IV Crop diversification for sustainability; role of organic matter in maintenance of soil fertility; crop residue management; fertilizer use efficiency and concept of fertilizer use in intensive cropping system. **UNIT V** Plant ideotypes for dry lands; plant growth regulators and their role in sustainability.

Suggested Readings Palaniappan SP &Sivaraman K. 1996. *Cropping Systems in the Tropics; Principles and Management. New Age.* Panda SC. 2003. Cropping and Farming Systems. Agrobios. Reddy SR. 2000. Principles of Crop Production. Kalyani.

Course Title : **Applied Regression Analysis**
Course Code : M.SC. AGRON-403-D

Objective This course is meant for students of all disciplines including agricultural and animal sciences. The students would be exposed to the concepts of correlation and regression. Emphasis will be laid on diagnostic measures such as autocorrelation, multicollinearity and Heteroscedasticity. This course would prepare students to handle their data for analysis and interpretation.

Theory

UNIT I Introduction to correlation analysis and its measures; Correlation from grouped data, Biserial correlation, Rank correlation; Testing of population correlation coefficients; Multiple and partial correlation coefficients and their testing.

UNIT II- Problem of correlated errors; Auto correlation; Durbin Watson Statistics; Removal of auto correlation by transformation; Analysis of collinear data; Detection and correction of multicollinearity; Regression analysis; Method of least squares for curve fitting; Testing of regression coefficients; Multiple and partial regressions.

UNIT III- Examining the multiple regression equation; Concept of weighted least squares; regression equation on grouped data; Various methods of selecting the best regression equation; regression approach applied to analysis of variance in one way classification.

UNIT IV- Heteroscedastic models, Concept of nonlinear regression and fitting of quadratic, exponential and power curves; Economic and optimal dose, Orthogonal polynomial.

Course Title : Seed Production Technology of Field Crops
Course Code : M.Sc AGRON-404-A

UNIT I Objectives of seed production technology: Role in increasing agriculture production seeds its importance, in green revolution difference between grain and seed. Concept of seed quality, steps involve in seed production. Principles of seed production, concept and factors that affect the seed quality in the growing; processing and distribution of seed, seed replacement rate, multiplication rate, seed industry in India and role of various agencies, important terminology used in seed industry, breeders, foundation, and certified seed, maintenance of genetic purity.

UNIT II Seed certification: Its concept, role & goal, necessity of seed certification, minimum seed certification standard for self and cross pollinated crops, Field and seed inspections, objectives, general principles and methods. Preparation of field reports, seed certification terms; seed certification agencies, certified and truthfully labeled seeds.

UNIT III Nucleus and breeders seed production of self pollinated crops: Viz. Rice, Wheat, Arhar, Gram, Soybean, Rapeseed and Mustard.

UNIT IV Maintenance of nucleus and breeders seed in cross pollinated crop varieties: in breeds and no-inbreeds, maintenance of seed of established varieties, foundation, and certified seed production of Maize inbreeds, single and double cross hybrids.

UNIT V Hybrid seed production: of Rice, Maize, Sorghum, and Bajra, and Sunflower using male sterility systems.

UNIT VI Latest released hybrids L of Rice, Maize, Sorghum, and Bajra, their characteristic features.

UNIT VII. Seed testing: Importance of seed testing in production of high quality seed. Techniques of seed testing; Sampling, Sample preparation for seed testing, purity testing, germination test, physiology of seed in relation to viability, vigour& dormancy of seeds, Varietal identification, through electrophoresis. Growth out test for cultivar, purity. Seed legislation and seed law enforcement including IPR, PBR in India. Recent development in seed industry. Genetic aspect of varietal deterioration.

UNIT VIII Seed processing storage and marketing principle & practices of seed drying and seed separation selecting of sources air and screen seed cleanness physical characteristics utilized in seed cleaning & grading; seed treatment, type of seed treatment, materials & methods of seed packing, factors affecting seed in storage, problems of stored grains pest & methods to avoid the loss. Distribution & marketing of seed.

Suggested Readings

1. U.S.D.A. Year Book Seeds, 1961.
2. International rules for seed testing I.S.T.A. proceedings 959. Vol. 2 & 3.

Course Title : Soil Conservation and Watershed Management
Course Code : M.Sc AGRON-404-B

Theory

UNIT I Soil erosion: definition, nature and extent of erosion; types of erosion, factors affecting erosion.

UNIT II Soil conservation: definition, methods of soil conservation; agronomic measures - contour cultivation, strip cropping, cover crops; vegetative barriers; improved dry farming practices; mechanical measures - bonding, gully control, bench terracing; role of grasses and pastures in soil conservation; wind breaks and shelter belts.

UNIT III Watershed management: definition, objectives, concepts, approach, components, steps in implementation of watershed; development of cropping systems for watershed areas.

UNIT IV Land use capability classification, alternate land use systems; agro-forestry; lay farming; *jhum* management - basic concepts, socio-ethnic aspects, its layout.

UNIT V Drainage considerations and agronomic management; rehabilitation of abandoned *jhum* lands and measures to prevent soil erosion.

Suggested Readings Arakeri HR & Roy D. 1984. Principles of Soil Conservation and Water Management. Oxford & IBH. Dhruvanarayana VV. 1993. Soil and Water Conservation Research in India. CAR. FAO. 2004. Soil and Water Conservation in Semi-Arid Areas. Soils Bull., Paper 57.

Course Title : Agronomy of Fodder and Pasture Crops

Course Code : M.Sc AGRON-404 -C

Theory

UNIT I Introduction, origin, history, distribution, adaptation, classification, climate, soil, varieties, water, weed management and nutrient requirement of important cultivated fodder crops like maize, pearl millet, teosinte, cluster bean, cowpea, oats, barley, berseem, senji, Lucerne etc.

UNIT II Introduction, origin, history, distribution, adaptation, classification, climate, soil, varieties, water, weed management and nutrient requirement of important forage crops/grasses/ legumes, like, Napier grass, guinea grass, Phulwa grass, Deenanath grass.

UNIT III Principles and methods of hayand silage making; chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage; use of physical and chemical enrichments and biological methods for improving nutrition; value addition of poor quality fodder.

UNIT IV Natural grasslands of India. Establishment of pastures and their management with special reference to weed control.

Suggested Readings

Das, N.R. 2007. *Introduction to Crops of India*. Scientific Publ. George, Thomas, C. 2003. *Forage Crop Production in the Tropics*. Kalyani Publishers. IGFRI. 1999. *Forage Production Technology - A Bulletin* by P.S.Tomar, N.P. Shukla and S.N. Tripathi