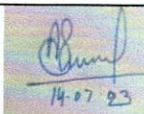

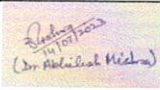





**Minutes of the Meeting of
Board of Studies (BoS) of M.Sc. Ag. Agronomy
School of Advanced Agriculture Sciences and Technology
14th July, 2023 (Online Mode)**

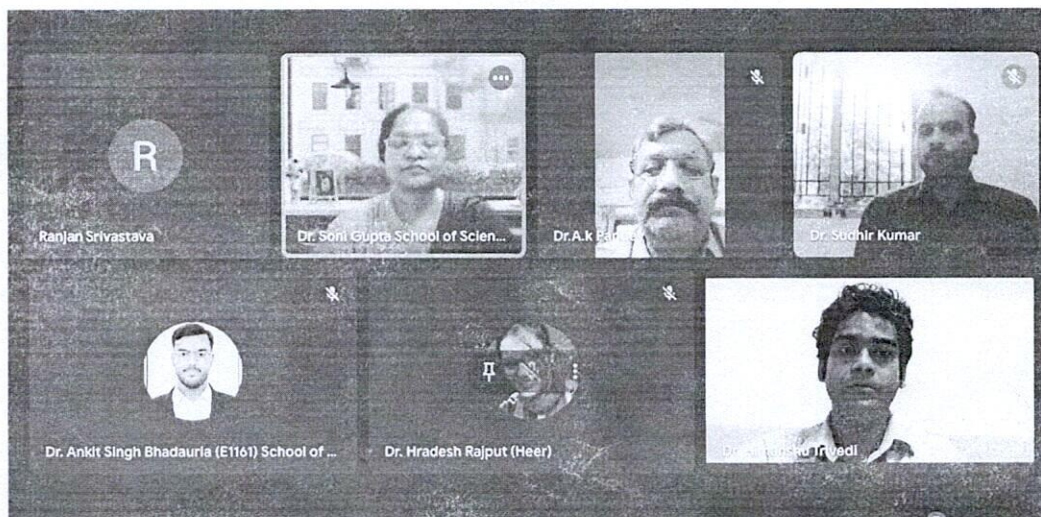
The Meeting of Board of Studies of School of Advanced Agriculture Sciences and Technology (SAAST) was conducted on 14th July, 2023 between 3.00 pm to 5.00 pm through Online Mode under the Chairmanship of Dr. A.K. Pandey, Dean, Agriculture, CSJMU Kanpur. Dr. Soni Gupta, In-charge, School of Advanced Agriculture Sciences and Technology (SAAST) welcomed the Members of Board of Studies and officials of the University. Dr. Himanshu Trivedi, Associate Professor, SAAST introduced the Members and experts of Board of Studies and University dignitaries by depicting their respective academic and professional profile. The following Members, Special Invitees and Experts were appeared to participate in this meeting through online mode (Google Meet).

Sl. No.	Name and Designation of Members and Experts of BoS	Role in BoS	
1.	Dr. A.K. Pandey , Dean Agriculture, CSJM University, Kanpur	Convener	
2.	Dr. Roli Sharma , Dean Academics, CSJM University, Kanpur	Member	
3.	Dr. Akhilesh Mishra , Professor Agronomy, Pulse Section, CSAUA&T, Kanpur	Expert (Agronomy)	
4.	Dr. Naushad Khan , Professor, Department of Agronomy, CSAUA&T, Kanpur.	Expert (Agronomy)	
5.	Dr. Soni Gupta , In-charge, School of Advanced Agriculture Sciences and Technology (SAAST), CSJM University, Kanpur	Member	
6.	Dr. Himanshu Trivedi , Associate Professor, School of Advanced Agriculture Sciences and Technology (SAAST), CSJM University, Kanpur	Member	
7.	Mr. Ankit Singh Bhadauria , Assistant Professor, School of Advanced Agriculture Sciences and Technology (SAAST), CSJM University, Kanpur	Member	

The suggestions / opinions /remarks of the participants are as below.

1. All experts and invitees put their opinion that presented course structures and syllabi of M.Sc. (Ag.) Agronomy is designed as per the guidelines and of 5th Dean's Committee and recommendations of BSMA constituted by ICAR for Post-graduate Programmes.
2. Replacement of course 'Computer Application' (3 credits) with a course 'Soil Fertility and Fertilizer use' (3 credit) in the Supporting courses category.
3. Inclusion of the course PGS 506 Disaster Management (1 credits) as per the suggestion of expert Dr. Akhilesh Mishra in the M.Sc (Ag.) Agronomy.
4. Credit of Research (30) to be divided in 10 in the 3rd Semester and 20 in the 4th semester in the M.Sc (Ag.) Agronomy course.

At the end of meeting, Dr. Soni Gupta, In-charge, School of Advanced Agriculture Sciences and Technology (SAAST) proposed vote of thanks to all experts, members appeared in this meeting.



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CHHATRAPATI SHAHU JI MAHARAJ UNIVERSITY, KANPUR
SCHOOL OF ADVANCED AGRICULTURE SCIENCES AND TECHNOLOGY (SAAST)
M. Sc (Ag.) Agronomy Course Structure

IST YEAR / IST SEM						
Course code	Type	Course title	Min credits	CIA	ESE	Max. Marks
AGRON 501	Core	Modern Concepts in Crop Production	3+0	50	50	100
AGRON 502	Core	Principles and practices of soil fertility and nutrient management	2+1	50	50	100
AGRON 506	Core	Agronomy of Major Cereals and Pulses	2+1	50	50	100
SAC 513	Minor	Management of Problematic Soils and Waters	2+1	50	50	100
PGS 501	Compulsory Non-Credit	Library and Information Services	0+1	100	00	100
PGS 502	Compulsory Non-Credit	Technical Writing and Communication Skills	0+1	100	00	100
TOTAL			14			600
IST YEAR/ IIND SEM						
AGRON 503	Core	Principles and Practices of Weed Management	2+1	50	50	100
AGRON 504	Core	Principles and Practices of Water Management	2+1	50	50	100
AGM 510	Minor	RS and GIS Applications in Agricultural Meteorology	2+1	50	50	100
STAT 511	Supporting	Experimental Designs	2+1	50	50	100
PGS 503	Compulsory Non-Credit	Intellectual Property and Its Management in Agriculture	1+0	50	50	100
PGS 504	Compulsory Non-Credit	Basic Concepts in Laboratory Techniques	0+1	100	00	100
TOTAL			14			600
IIND YEAR/IIIRD SEM						
AGRON 507	Core	Agronomy of Oil Seed, Fibre and Sugar Crops	2+1	50	50	100
AGRON 513	Core	Principles & Practices of Organic Farming	2+1	50	50	100
SAC 502	Minor	Soil Fertility and Fertilizer Use	2+1	50	50	100
PP 501	Supporting	Principles of Plant Physiology I - Plant Water Relations and Mineral Nutrition	2+1	50	50	100
PGS 505	Compulsory Non-Credit	Agricultural Research, Research Ethics and Rural Development Programmes	1+0	50	50	100
PGS 506	Compulsory Non-Credit	Disaster Management	1+0	50	50	100
AGRON 560	Research	Master's Research (Thesis/Dissertation)	10	-	-	S
TOTAL			24			600
IIND YEAR/IVTH SEM						
AGRON 550	Seminar	Master's Course Seminar	0+1	-	-	100
AGRON 560	Research	Master's Research (Thesis/Dissertation) Thesis Report Viva-Voce Examination	20+0			S
TOTAL			21			100
GRANDTOTAL			73			1900



M. Sc (Ag.) Agronomy Course Structure

First Semester

(AGRON 501) Modern concept in Crop Production (3+0)

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.

AGRON 502 Principles and practices of soil fertility and nutrient management 3(2+1)

Theory

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic nutrients; economics of fertilizer use; integrated nutrient

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management; use of vermincompost and residue wastes in crops.

Practical

1. Determination of soil pH and soil EC
2. Determination of soil organic C
3. Determination of available N, P, K and S of soil
4. Determination of total N, P, K and S of soil
5. Determination of total N, P, K, S in plant
6. Computation of optimum and economic yield

AGRON 506 Agronomy of major Cereals and Pulses

3(2+1)

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

Practical

1. Phenological studies at different growth stages of crop
 2. Estimation of crop yield on the basis of yield attributes
 3. Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
 4. Working out growth indices (CGR, RGR, NAR, LAI, LAD, LAR, LWR, SLA, SLW etc)
 5. 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)
 6. Estimation of protein content in pulses
 7. Planning and layout of field experiments
 8. Judging of physiological maturity in different crops
 9. Intercultural operations in different crops
 10. Determination of cost of cultivation of different crops
 11. Working out harvest index of various crops
 12. Study of seed production techniques in selected crops
 13. Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to nearby villages for identification of constraints in crop production

(SAC 513) MANAGEMENT OF PROBLEMATIC SOILS AND WATERS (2+1)

Theory

UNIT I

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

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UNIT II

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

UNIT III

Management of salt-affected soils; salt tolerance of crops - mechanism and ratings; monitoring of soil salinity in the field; management principles for sandy, clayey, red lateritic and dry land soils.

UNIT IV

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 its management.

UNIT V

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 VI

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

Practical

Characterization of acid, acid sulfate, salt-affected and calcareous soils

Determination of cations (Na^+ , K^+ , Ca^{++} and Mg^{++}) in ground water and soil samples

Determination of anions (Cl^- , SO_4^{--} , CO_3^{--} and HCO_3^-) in ground waters and soil samples

Lime and gypsum requirements of acid and sodic soil

PGS 501 LIBRARY AND INFORMATION SERVICES

1(0+1)

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.

PGS 502 TECHNICAL WRITING AND COMMUNICATIONS SKILLS

(0+1)

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

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transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers.

Second Semester

AGRON 503 Principles and Practices of Weed Management

3(2+1)

Theory

Unit I 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 of nano-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 combination and 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 perennial weed 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

1. 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,
2. Bioassay of herbicide resistance residues,
3. Calculation of herbicidal herbicide requirement

AGRON 504 Principles and Practices of Water Management

3(2+1)

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 losses.

Unit III

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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.

AGM 510: RS and GIS Applications in Agricultural Meteorology (2+1)

THEORY

Unit I

Basic components of remote sensing- signals, sensors and sensing systems; active and passive remote sensing.

Unit II

Characteristics of electromagnetic radiation and its interaction with matter; spectral features of earth's surface features; remote sensors in visible, infrared and microwave regions.

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Unit III

Imaging and non-imaging systems; framing and scanning systems; resolution of sensors; sensor platforms, their launching and maintenance. Drone technology.

Unit IV

Data acquisition system, data preprocessing, storage and dissemination; digital image processing and information extraction.

Unit V

Microwave remote sensing; visual and digital image interpretation; introduction to GIS and GPS.

Unit VI

Digital techniques for crop discrimination and identification; crop stress detection - soil moisture assessment, inventory of ground water and satellite measurement of surface soil moisture and temperature; drought monitoring, monitoring of crop disease and pest infestation. Use of satellite data in weather forecasting.

Unit VII

Soil resource inventory; land use/land cover mapping and planning; integrated watershed development; crop yield modeling and crop production forecasting.

VI. Practical

- Acquisition of maps
- Field data collection
- Map and imagery scales
- S/W and H/W requirements and specifications for remote sensing
- Data products, their specifications, media types, data inputs, transformation, display types, Image enhancement
- Image classification methods
- Evaluation of classification errors
- Crop discrimination and acreage estimations
- Differentiation of different degraded soils
- Time domain reflectometry.
- Use of spectrometer and computation of vegetation indices
- Demonstration of case studies
- Hands on training

(STAT511) EXPERIMENTAL DESIGNS**3(2+1)****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, completely randomized 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.

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PRACTICAL

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

PGS 503 INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE 1(1+0)

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.

PGS 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES

1(0+1)

PRACTICAL

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micro pipettes 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; Neutralization 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, sand bath, water bath, oil bath; 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.

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Third Semester

AGRON 507 Agronomy of oilseed, fibre and sugar crops

3(2+1)

Theory

Origin and history, area and production, classification, improved varieties, Physical Sciences: Agronomy 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.

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

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aspects

- Visit to nearby villages for identification of constraints in crop production.

AGRON 513: Principles and practices of organic farming

3(2+1)

Theory

Unit I

Organic farming - concept and definition, its relevance to India and global agriculture and future prospects; principles of organic agriculture; organics and farming standards; organic farming and sustainable agriculture; selection and conversion of land, soil and water management - land use, conservation tillage; shelter zones, hedges, pasture management, agro-forestry.

Unit II

Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and biogas technology.

Unit III

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

Unit IV

Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides.

Unit V

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

Practical

Method of making compost by aerobic method

Method of making compost by anaerobic method.

Method of making vermicompost.

Identification and nursery rising of important agro-forestry trees and trees for shelter belts.

Efficient use of biofertilizers, technique of treating legume seeds with Rhizobium cultures, use of Azotobacter, Azospirillum, and PSB cultures in field.

Visit to a biogas plant.

Visit to an organic farm.

Quality standards, inspection, certification and labeling and accreditation procedures for farm produce from organic farms.

SAC 502 Soil Fertility & Fertilizer Use (2+1)

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;

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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 and alkali soils; factors affecting phosphorus availability in soils; phosphatic fertilizers-behavior in soils and management under field conditions. Potassium - forms, equilibrium in soils and its agricultural significance; mechanism of potassium fixation; management of potassium fertilizers under field conditions.

UNIT IV:

Sulphur-source, forms, fertilizers and their behavior in soils; role in crops and human 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-intensity relationships; 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; specialty fertilizers concept, need and category. Current status of specialty fertilizers uses in soils and crops of India.

UNIT IX:

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

UNIT X:

Definition and concepts of soil health and soil quality; long term effects of fertilizers and soil quality.

PRACTICALS

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).

PP 501 Principles of Plant Physiology I - Plant Water Relations and Mineral Nutrition**(2+1)****Theory****Block I: Plant Water Relations****Unit 1: Soil and Plant Water Relations**

Water and its importance; Molecular structure of water; Properties and functions of water. Concept of water potential; Plant cell and soil water potential and their components; Methods to determine cell and soil water potential; Concept of osmosis and diffusion. Soil physical

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properties and water availability in different soils; Water holding capacity and approaches to improve WHC; Concept of FC and PWP; Water holding polymers and their relevance.

Unit 2: Water Absorption and Translocation

Root structure and functions; Root architecture and relevance in water mining; Mechanism of water absorption and translocation; Theories explaining water absorption and translocation; Aquaporins. Mycorrhizal association and its relevance in water mining.

Unit 3: Transpiration and Evaporative Cooling

Evaporation and transpiration; relevance of transpiration; factors regulating transpiration; Measurement of transpiration; approaches to minimize evaporation and transpiration; Concept of CCATD and its relevance. Energy balance: Solar energy input and output at crop canopy level. Stomata- its structure, functions and distribution; Molecular mechanisms of stomatal opening and closing; Concept of guard cell turgidity; role of K and other osmolytes; role of ABA in stomatal closure; Guard cells response to environmental signals; Signaling cascade associated with stomatal opening and closure. Anti transpirants and their relevance in agriculture.

Unit 4: Water Productivity and Water Use Efficiency

WUE and its relevance in water productivity; Transpiration efficiency, a measure of intrinsic WUE; Approaches to measure WUE; Stomatal and mesophyll regulation on WUE; Passioura's yield model emphasizing WUE.

Unit 5: Moisture Stress and Plant Growth

Physiology of water stress in plants; Effect of moisture stress at molecular, cellular, organ and plant level. Drought indices and drought tolerance strategies. Drought tolerance traits.

Block 2: Mineral Nutrition

Unit 1: Nutrient Elements and Their Importance

Role of mineral nutrients in plant's metabolism; Essential elements and their classification; Beneficial elements; factors influencing the nutrients availability; critical levels of nutrients. Functions of mineral elements in plants. Deficiency and toxicity symptoms in plants.

Unit 2: Nutrient Acquisition

Mechanism of mineral uptake and translocation; Ion transporters; genes encoding for ion transporters; localization of transporters; xylem and phloem mobility; Nutrient transport to grains at maturity; Strategies to acquire and transport minerals under deficient levels. Role of mycorrhiza, root exudates and PGPRs in plant nutrient acquisition.

Unit 3: Concept of Foliar Nutrition

Foliar nutrition; significance and factors affecting total uptake of minerals; Foliar nutrient droplet size for effective entry; role of wetting agents in entry of nutrients.

VII. Practicals

- Standard solutions and preparation of different forms of solutions
 - Studies on the basic properties of water
 - Demonstration of surface tension of water and other solvents
 - Measurement of plant water status: Relative water content and rate of water loss
- Restructured and Revised Syllabi of Post-graduate Programmes Vol. 2
- Determination of water potential through tissue volume and Chardakov's test
 - Determination of water potential using pressure bomb, osmometer, psychrometer
 - Determination of soil moisture content and soil water potential
 - Use of soil moisture probes and soil moisture sensors
 - Measurement of transpiration rate in plants; use of porometry
 - Measurement of CCATD and its relevance
 - Demonstration and use of anti-transparent to reduce transpiration
 - Influence of potassium and ABA on stomatal opening and closing respectively

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- Deficiency and toxicity symptoms of nutrients
- Effect of water stress on plant growth and development

PGS: 505 AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES

1(1+0)

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 Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

PGS 506 Disaster Management (1+0)

Theory

Natural Disasters-Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

AGRON 560	Master's Research (Thesis/Dissertation)	Credits 10.0
Fourth Semester		
AGRON 550	Master's Course Seminar	0+1
AGRON 560	Master's Research (Thesis/Dissertation)	20+0
	Thesis Report	
	Viva-Voce Examination	

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