M.Sc. AGRICULTURE

SEMESTER-I (SOIL SCIENCE)

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal Assesment		Total Marks		Grand Total
			Th.	Pract.	Th.	Pract.	Th.	Pract.	Th.	Pract.	
1	SSC-511	Soil Physics	4	3	80	40	20	10	100	50	150
2	SSC-512	Soil Fertility and fertilizer use	4	6	80	40	20	10	100	50	150
3	SSC-513	Soil Chemistry	4	3	80	40	20	10	100	50	150
4	AGR- 410 (Minor)	Crop Ecology	4	6	80	40	20	10	100	50	150
5	STA-415	Statistical Methods for Research Workers	4	3	80	40	20	10	100	50	150
6.	*SSC-413	Analytical Techniques in Soils, Plants, Fertilizers and Water									NC
	Total		**20**	**21**	**400**	**200**	**100**	**50**	**500**	**250**	**750**

*Note: The students from the stream other than they opted for Post Graduate classes will have to clear UG course of Elective subject with UG classes as per schedule.

M.Sc. AGRICULTURE

SEMESTER-II (SOIL SCIENCE)

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal Assesment		Total Marks		Grand Total
			Th.	Pract.	Th.	Pract.	Th.	Pract.	Th.	Pract.	
1	SSC-521	Soil Mineralogy, Genesis, Classification and Survey	4	3	80	40	20	10	100	50	150
2	SSC-522	Soil Biology and Biochemistry	4	6	80	40	20	10	100	50	150
3	SSC-523	Soil Erosion and Conservation	4	3	80	40	20	10	100	50	150
4	AGR-420 (Minor)	Farm Cropping System	4	6	80	40	20	10	100	50	150
5	STA-425	Experimental Designs for Research Worker	4	3	80	40	20	10	100	50	150
6.	*SSC-422	Soil Physical and Biological Environment									NC
7.	*SSC-423	Soil Survey, Classification and Mapping									NC
	Total		**20**	**21**	**400**	**200**	**100**	**50**	**500**	**250**	**750**

*Note: The students from the stream other than they opted for Post Graduate classes will have to clear UG course of Elective subject with UG classes as per schedule.

M.Sc. AGRICULTURE

SEMESTER-III (SOIL SCIENCE)

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal Assesment		Total Marks		Grand Total
			Th.	Prac	Th.	Prac	Th	Prac	Th	Prac	
1	SSC-531	Soil,Water and Air Pollution	4	3	80	40	20	10	100	50	150
2	SSC-532	Analytical Techniques and Instrumental Methods	4	6	80	40	20	10	100	50	150
3	SSC-430 / AGM-430// BOT-430 (Minor)	Fertilizer Technology / / Fundamentals of Agroclimatology/ Physiology of Growth & Development	4	3	80	40	20	10	100	50	150
4		Credit seminar	3		100				100		100
5		Research Work (Four periods per Teacher per Student)	-	4							
	Total		**15**	**16**	**340**	**120**	**60**	**30**	**400**	**150**	**550**

M.Sc. AGRICULTURE

SEMESTER-IV (SOIL SCIENCE)

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal assessment		Total Marks		Grand Total
			Th.	Pract.	Th.	Pract.	Th.	Prac	Th	Prac	
1	SSC-541	Management of Problem Soils and Water	4	3	60	20	15	05	75	25	100
2.	SSC-542	System Approaches in Soil and Crop Studies	4	0	80		20		100		100
3		Research Work (Four Periods per Teacher Per Student)		4		250				250	250
		Total	**08**	**07**	**140**	**270**	**35**	**05**	**175**	**275**	**450**

M.Sc. AGRICULTURE

SEMESTER-I
(SOIL SCIENCE)

SSC-511 **Soil Physics**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Soil physical behavior. Soil consistence. Dispersion and workability of soils. Soil compaction and consolidation. Soil strength-bulk density relations. Swelling and shrinkage-basic concepts. Soil structure165 genesis, characterization and management. Soil tilth. Soil crusting - mechanism, factors affecting and evaluation. Soil conditioners. Puddling, its effect on soil physical properties. Soil water - retention, constants. Energy state of soil water, soil-moisture characteristics. Hysteresis. Water flow in saturated and unsaturated soils, Darcy's law, hydraulic conductivity, permeability. Infiltration, internal drainage and redistribution. Evaporation. Hydrologic cycle, field water balance. Soil-plant-atmosphere continuum. Composition, renewal and measurement of soil air. Aeration requirement for plant growth. Modes of energy transfer in soils, energy balance, thermal properties of soil. Soil temperature in relation to plant growth.

Practical:

Mechanical analysis of soil. Measurement of Atterberg limits. Aggregate analysis. Measurement of soil-water content. Measurement of soil-water potential. Determination of soil-moisture characteristics curve and computation of pore-size distribution. Determination of hydraulic conductivity under saturated and unsaturated conditions. Determination of infiltration rate of soil. Determination of aeration porosity and oxygen diffusion rate. Soil temperature measurements.

M.Sc. AGRICULTURE

SEMESTER-I

(SOIL SCIENCE)

SSC-512 **Soil Fertility and Fertilizer Use**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Soil fertility and soil productivity. Nutrient sources - fertilizers and manures. Soil N - sources and N transformations. Biological nitrogen fixation. Nitrogenous fertilizers - their fate in soils and enhancing N use efficiency. Soil P - forms, reactions in soils and factors affecting availability. Management of P fertilizers. Potassium- forms, mechanism of fixation, Q/I relationships. Management of K fertilizers. Sulphur, Ca and Mg - source, forms, fertilizers and their behavior in soils and management. Micronutrients- critical limits in soils and plants, factors affecting their availability, sources and management. Common soil test methods for fertilizer recommendations. Site-specific and plant need based nutrient management. Integrated nutrient management. Blanket fertilizer recommendations- usefulness and limitations. Soil fertility evaluation. Soil quality in relation to sustainable agriculture.

Practical:

Laboratory and greenhouse experiments for evaluation of indices of nutrient availability and their critical values in soils and plants. Chemical analysis of soil for total and available nutrients. Analysis of plants for essential elements.

M.Sc. AGRICULTURE

SEMESTER-I
(SOIL SCIENCE)

SSC-513 **Soil Chemistry**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Chemical composition of earth's crust and soils. Elements of equilibrium thermodynamics, chemical equilibria, electrochemistry and chemical kinetics. Inorganic and organic colloids-surface charge characteristics, diffuse double layer theories, zeta potential stability, coagulation/ flocculation, peptization, electrometric and sorption properties of soil colloid. Soil organic matter-fractionation, clay-organic interactions. Cation exchange-theories, adsorption isotherms, Donnan-membrane equilibrium concept, clay-membrane electrodes and ionic activity measurement, thermodynamics, anion and lig and exchange inner sphere and outer-sphere surface complex formation, fixation of oxyanions, hysteresis in sorptiondesorption of oxy-anions and anions. Experimental methods to study ion exchange phenomena and practical implications in plant nutrition. Potassium, phosphate and ammonium fixation in soils and managementaspects. Chemistry of acid, salt-affected and submerged soils and management aspects.

Practical:

Analysis of equilibrium soil solution for electrochemical properties. Determination of point ofzero-charge and associated surface charge characteristics. Potentiometric and conductometric titration of soil humic and fulvic acids. E4/E6 ratio of soil humic and fulvic acids. Adsorption-desorption of phosphate/ sulphate. Construction of adsorption envelop of soils by using phosphate/fluoride/sulphate and ascertaining the mechanism of the ligand exchange process involved. Determination of titratable acidity of an acid soil.

M.Sc. AGRICULTURE

SEMESTER-I

(SOIL SCIENCE)

AGR-410 Crop Ecology (Minor)

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory

Ecology in relation to crop; Eco system- components and energy flow- food chain and energy output relationships; Agro- ecosystem and agro-ecological zones of India; Efficient food producing systems; Farming system of the world-arable, pastoral, lay farming, shifting cultivation, ranching and agro-forestry systems, energy and fuel, wood plantations; Specialized and diversified forming; Family, co-operative and collective farming, their occurrence and adaptation and weakness; Cropping systems, their characteristics and management; Cropping patterns; Farm selection , size of the farm and farm layout, cropping schemes and crop plans ; Solar radiation concepts, laws and their absorption in crop system; Bio-geo-chemical cycle and their significance.

Practical: **Time: 3 Hours**

Analysis of crop ecosystem components; Light measurement in pure and mixed crop stands; Modification in crop environment; Measuring temperature, light and moisture effects: Preparation of farm lay out plans, different intensity crop rotations and cropping schemes; Estimating crop yields; Energy budgeting in different crops and cropping systems; Working out ecological optimum crop zones.

M.Sc. AGRICULTURE

SEMESTER-I

(SOIL SCIENCE)

STA-415: Statistical Methods for Research Workers

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Probability and fitting of standard frequency distributions, sampling techniques, sampling distributions, mean and standard error, simple partial, multiple and intraclass correlation and multiple regression, tests of significance, students'-t, chi-square and large sample tests, confidence intervals, analysis of variance for one way and two way classification with equal call frequencies, transformation of data.

Practical:

Fitting of distributions, samples and sampling distributions, correlation and regression, tests of significance and analysis of variance.

M.Sc. AGRICULTURE

SEMESTER-I

(SOIL SCIENCE)

***SSC-413 Analytical Techniques in Soils, Plants, Fertilizers and Water**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per Week 4+6

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Colorimetric and flame photometric methods. Atomic absorption spectrophotometery. Cation and anion exchange phenomenon and their importance. Ion adsorption, desorption and fixation in soils. Methods ofsoil fertility evaluation. Fertilizer control order. Acid, saline, sodic, calcareous soils and their amelioration. Planning and formulation of project on establishment of soil water and plant testing laboratory.

Practical:

Preparation of standard solutions. Collection of soil, water, plant and fertilizer samples. Analysis of soil samples for fertility and quality evaluation for field crops and orchard plantations. Analysis of irrigation water for quality appraisal. Fertilizers analysis for quality control. Soil, water and fertilizer analysis reports for recommendation purposes. Analysis of forms of nitrogen , phosphorous, potassium and sulphur in soils. Determination of DTPA-extractable micronutrients. Plant analysis for total N, P, K andmicro-nutrients. Determination of CEC and AEC of soils. Nutrient adsorption and fixation capacities of soils.

M.Sc. AGRICULTURE

SEMESTER-II
(SOIL SCIENCE)

SSC-521 Soil Mineralogy, Genesis, Classification and Survey

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Fundamentals of crystallography, space lattice, coordination theory, isomorphism and polymorphism. Classification, structure, chemical composition and properties of clay minerals. Genesis and transformation of crystalline clay minerals. Amorphous soil constituents and other non-crystalline silicate minerals. Clay minerals in Indian soils. Soil formation - factors, models, processes. Weathering of rocks and mineral transformations. Soil profile. Soil classification systems - historical developments and modern systems of soil classification. Soil survey- types, techniques. Soil series- characterization and procedure for establishing soil series, benchmark soils and soil correlations. Soil survey interpretations. Techniques for generation of soil maps. Landform- soil relationship, major soil groups of India with special reference166 to respective states. Land capability and land irrigability classification. Land evaluation and land use type. Approaches for managing soils and landscapes in the framework of agro-ecosystem.

Practical:

Identification and quantification of minerals in soils. Morphological properties of soil profile in different landforms. Classification of weathering indices and its application in soil formation. Grouping soils using available data base in terms of soil quality. Cartographic techniques for preparation of maps, processing of field sheets, compilation and obstruction of maps in different scales. Land use planning exercises using conventional and RS tools

M.Sc. AGRICULTURE

SEMESTER-II
(SOIL SCIENCE)

SSC-522 **Soil Biology and Biochemistry**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Soil biota, soil microbial ecology, types of organisms. Soil microbial biomass, microbial interactions, un-culturable soil biota. Microbiology and biochemistry of root-soil interface. Phyllosphere. Soil enzymes, origin, activities and importance. Soil characteristics influencing growth and activity of microflora. Microbial transformations of N, P, S, Fe and Mn in soil. Biochemical composition and biodegradation of soil organic matter and crop residues. Humus formation. Cycles of important organic nutrients. Biodegradation of pesticides, organic wastes and their use for production of biogas and manures. Biotic factors in soil development. Microbial toxins in the soil. Preparation and preservation of organic manures, rural and urbancomposts and vermicompost. Biofertilizers - definition, classification, specifications, method of productionand role in crop production.

Practical:

Determination of soil microbial population. Soil microbial biomass. Elemental composition, fractionation of organic matter and functional groups. Decomposition of organic matter in soil. Soil enzymes. Measurement of important soil microbial processes such as ammonification, nitrification, N2 fixation, S oxidation, P solubilization and mineralization of other micro nutrients. Study of rhizosphere effect.

M.Sc. AGRICULTURE

SEMESTER-II

(SOIL SCIENCE)

SSC-523 **Soil Erosion and Conservation**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

History, distribution, identification and description of soil erosion problems in India. Soil erosion by waterfactors and mechanism. Raindrops and soil erosion. Rainfall erosivity - estimation of erosivity indices. Soil erosion in relation to soil properties. Wind erosion- factors affecting, extent of problem. Principles and practices of erosion control. Soil conservation planning in hilly, arid and semi-arid regions, waterlogged and wet lands. Type, factors and processes of soil/land degradation and its impact on soil productivity. Watershed management. Water harvesting, recycling and flood control. Socio-economic aspects of watershed management. Case studies in respect to monitoring and evaluation of watersheds. Use of remote sensing in assessment and planning of watersheds.

Practical:

Determination of different soil erodibility indices- suspension percentage, dispersion ratio, erosion ratio, clay ratio, clay/moisture equivalent ratio, percolation ratio, raindrop erodibility index. Computation of kinetic energy of falling rain drops. Computation of rainfall erosivity indices (EI30) using rain gauge data. Measurement and estimation of runoff and soil loss. Visits to soil and water conservation works.

M.Sc. AGRICULTURE

SEMESTER-II
(SOIL SCIENCE)

AGR-420: Farm Cropping System (Minor)

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory

Farming systems-introductions terms and definitions ; Concept and its role in sustainability of agriculture; Factor effecting choice of farming system; Resource management in relation to farm cropping system; Crop yield appraisals; Plant interaction, criteria for assessing yield advantages ;Indices for evaluating productivity and efficiency; Agronomic consideration interaction in sequential cropping ; Evaluation and productivityof multiple cropping systems; Cropping systems in dry land farming; Cropping systems for irrigated areas; Cropping systems in high rainfall areas; Cropping systems with perennials; Introduction to agro forestry concept; Physiological and actual maturity of crop and criteria of crop harvest; Comparison of chemical and organic farming;

Practical: **Time: 3 Hours**

Visit to farming system and agro-based industries; Farm lay out plan, cropping scheme; Practical study of raising crops: Wheat, Rice, Maize Sugarcane, Groundnut, Toria, Gobi Sarson; Estimation of crop yield, calculation of harvest index, land equitant ratio in mixed crops/ intercrops.

M.Sc. AGRICULTURE

SEMESTER-II
(SOIL SCIENCE)

STA-425: Experimental Designs for Research Workers

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Need for designing of experiments- characteristics of a good design, basic principles- randomization, replication and local control, uniformity trials- size and shape of plots and blocks, analysis of variance and interpretation of data, completely randomized, randomized block and latin square design, multiple comparison tests, factorial experiments- interpretation of main effects and interactions, orthogonality and partitioning of degrees of freedom confounding in 2^3 , 2^4 and 3^3 designs, split and strip plot designs, crossover designs and balanced incomplete block designs, response surface designs, switch over trials and long term experiments; Selection of experimental design, mechanical errors in field experiments and methods of reducing it, presentation of research results.

Practical:

Uniformity trials, completely randomized, randomized block and latin square designs, missing plot and analysis, of covariance, 2^3 ,2^4 and 3^3 simple and confounded experiments, split and strip plot designs, cross over and balanced incomplete block designs.

M.Sc. AGRICULTURE

SEMESTER-II
(SOIL SCIENCE)

***SSC-422 Soil Physical and Biological Environment**

Time: 3 Hours **Max. Marks: 150**
Theory: 80
Practical: 40
Internal assessment 20+10=30
Periods per Week 4+6

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Soil physical properties in relation to crop production. Soil thermal regime and its management. Soil air-composition, renewal, characterization of soil aeration in relation to plant growth. Movement of water in soil. Infiltration and redistribution of water in soil. Evaporation from soils and its management. Runoff from the agricultural fields and factors affecting. Soil organisms and their distribution, ecology, classification and activities in soil. Microbiological transformations of C, N and S in soils.

Practical:

Determination of dry and wet stability of aggregates. Measurement of in situ soil bulk density and filling of soil columns with a particular bulk density. Measurement of soil porosity. Determination of consistency limits of soils. Soil moisture characteristics. Measurement of soil temperature using thermocouples. Determination of infiltration rate under different surface conditions. In situ measurement of soil moisture by neutron probe and Time Domain Reflectrometry. In situ measurement of soil matric potentialusing tensiometers. Enumeration of soil bacteria, fungi and actinomycetes. Isolation of Rhizobiumand Azotobacter and measurement of respiration rate.

M.Sc. AGRICULTURE

SEMESTER-II
(SOIL SCIENCE)

***SSC-423 Soil Survey, Classification and Mapping**

Time: 3 Hours **Max. Marks: 50**
Practical: 40
Internal assessment =10
Periods per Week: 0+6

Instructions for the paper setters

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Practical:

Application and use of global positioning system for soil survey. Macro-morphological study of soils. Classification of soils developed on different landforms. Study of base maps-cadastral maps, top sheets, aerial photographs and satellite imageries. Soil survey of project area-preparation of base maps, analysis of soil characteristics, classification of surveyed soils, mapping and report writing. Interpretation of soil survey data for land capability and crop suitability classifications. Use of geographical information system for preparing thematic maps

M.Sc. AGRICULTURE

SEMESTER-III
(SOIL SCIENCE)

SSC-531 **Soil, Water and Air Pollution**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Soil, water and air pollution problems associated with agriculture. Nature and sources of pollutantstheir CPC standards and effect on plants, animals and human beings. Sewage and industrial effluents - their composition and effect on soil, plant growth and human beings. Soil as sink for waste disposal. Pesticides - their classification, behavior in soil and effect on soil micro-organisms. Toxic elements - their sources, behavior in soils, effect on nutrients availability and on plant and human health. Pollution of water resources. Emission of greenhouse gases. Remediation/amelioration of contaminated soil and water, remote sensing applications in monitoring and management of soil and water pollution to
safeguard food safety.

Practical:

Sampling of sewage waters and sludge, industrial wastes, polluted soils and plants. Estimation of dissolved and suspended solids, COD, BOD, nitrate and ammonical N and P, heavy metal content in effluents. Heavy metals in contaminated soils and plants. Air sampling and determination of particulate matter and oxides of S. Visit to various industrial sites to study the impact of pollutants on soil and plants.

M.Sc. AGRICULTURE

SEMESTER-III
(SOIL SCIENCE)

SSC-532 Analytical Techniques and Instrumental Methods

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+6

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Atomic structure. Radioisotopes-properties and decay principles. Principles and use of radiation monitoring instruments. Isotopic dilution techniques. Doses of radiation exposure, radiation safety aspects. Storage and handling of radioactive materials. Principles of visible, ultraviolet and infrared spectrophotometery, inductively coupled plasma spectrometry, chromatographic techniques, mass spectrometry and X-ray defractrometery.

Practical:

Oxidation-reduction and complexo- metric titration. Soil, water and plant sampling techniques, their processing and handling. Determination of nutrient potentials and potential buffering capacities of soils for P and K. Identification of minerals by different methods. Electrochemical titration of clay. Estimation of root CEC. Analysis of soil and plant samples for N, P, K, Ca, Mg, S, Zn, Cu, Fe, Mn, B and Mo. Analysis of plant materials by digesting plant material by wet and dry ashing and soil by wet digestion methods. Drawing normalized exchange isotherms. Measurement of redox potential. Preparation of soil and plant samples for radioactive measurements. Determination of half life and decay constant.

M.Sc. AGRICULTURE

SEMESTER-III
(SOIL SCIENCE)

SSC-430 **Fertilizer Technology (Minor)**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Fertilizer industry in India; Raw materials; Manufacture of different types of fertilizers including reactions and flow diagrams; Granulation, segregation, caking, drying and cooling of fertilizers; Complex, mixed, liquid, suspension and slow release fertilizers; Production of fertilizers containing secondary and micronutrients; Changing trends in fertilizer technology.

Practical:

Collection of soil and fertilizer samples; Preparation of standard solutions. Colorimetric and flame photometric methods; Analysis of soil for fertilizer recommendations and suitability for orchard plantation; Gypsum and lime requirements of soil; Analysis of fertilizer for quality control; Planning and formulation of project on establishment of soil and fertilizer testing laboratories. Visit to fertilizer factories.

M.Sc. AGRICULTURE

SEMESTER-III
(SOIL SCIENCE)

AGM-430 **Fundamentals of Agroclimatology (Minor)**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Survey of the atmosphere; introduction to basic meteorological processes; nature, receipt and disposal of solar radiation; Atmospheric humidity and forms condensation; Evaporation and evapotranspiration ; Winds, air masses and disturbance ;influence of climate on plants, animals and pests; Meterological droughts; indices in agroclimatrology ; Agroclimatic classifications and their application; field climate modification.

Practical:

Meteorological instruments and their use in the measurement of agroclimatic environment; Measurement of field climate; Computation of agroclimatic indices-GDD, PTU, PET etc; Determining crop production sensitivity to weather.

M.Sc. AGRICULTURE

SEMESTER-III
(SOIL SCIENCE)

BOT-430 **Physiology of Growth and Development**

Time: 3 Hours **Max. Marks: 150**

Theory: 80

Practical: 40

Internal assessment 20+10=30

Periods per week : 04+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Concepts of growth, differentiation and pattern formation; growth curves, meristems, growth kinetics, factors affecting growth and general aspects of development, level of differentiation, control of development at genetic level. Hormones and growth regulators - auxins, gibberellins, cytokinins, ethylene, ABA, other inhibitors, retardants, polyamines, aliphatic alcohols, brassins, hormonal regulation of growth and development, plant movements; photoperiodism, phytochrome, flowering hormones, vernalization, abscission, ageing, senescence; physiology of seed and fruit development; seed germination; seed and bud dormancy. Plant physiology and agriculture.

Practical:

Experiments on growth measurements, hormonal bioassays, plant movements; experiments on quality of light on seed germination, breaking of dormancy. Experiments on photoperiodism. Experiments on hormonal regulation of development.

M.Sc. AGRICULTURE

SEMESTER-III
(SOIL SCIENCE)

CREDIT SEMINAR

Total Marks: 100
Periods per week: 03

M.Sc. AGRICULTURE

SEMESTER-IV
(SOIL SCIENCE)

SSC-541 **Management of Problem Soils and Water**

Time: 3 Hours **Max. Marks: 100**

Theory: 60

Practical: 20

Internal Assessment15+5==20

Periods per week :4+3

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Area, distribution, origin and basic concepts of problematic soils. Morphological features and characterization of salt-affected soils. 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. Acid soils - nature, sources and management. Effect on plant growth. Lime requirement of acid soils. Biological sickness of soils and its management. Quality of irrigation water, management of brackish water. Salt balance under irrigation. Characterization of brackish waters, area and extent. 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(CI-, SO4 2-, CO3 2- and HCO3 -) in ground waters and soil samples. Lime and gypsum requirement of acid and sodic soil.

M.Sc. AGRICULTURE

SEMESTER-IV
(SOIL SCIENCE)

SSC-542 System Approaches in Soil and Crop Studies

Time: 3 Hours **Max. Marks: 100**

Theory: 80

Internal Assessment=20

Periods per week :04

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. Not more than one question should be based on one topic.
4. The question paper should cover the whole syllabus and questions should be evenly distributed.
5. At least eight questions should be set, out of which the candidates should be required to attempt any five.

Theory:

Systems concepts- definitions, general characteristics, general systems theory. Systems - thinking, dynamics, behavior and study. Model - definition and types. Mathematical models and their types. Modelingconcepts, objectives, processes, abstraction techniques. Simulation models, their verification and validation, calibration. Representation of continuous systems simulation models- procedural and declarative. Simulationmeaning and threats, experiment, design and analysis. Application of simulation models in understanding system behavior, optimizing system performance, evolution of policy options under different soil, water, and nutrient, climatic and cultural conditions. Decision support system, use of simulation models in decision support system.

M.Sc. AGRICULTURE

SEMESTER-IV
(SOIL SCIENCE)

RESEARCH WORK

Total Marks: 250
Periods per week: 04