SCHEME : SCHOOL OF AGRICULTURE

COURSE: MASTER OF SCIENCE (AGRICULTURE)

BRANCH: SOIL SCIENCE & AGRICULTURAL CHEMISTRY

DURATION: 4 SEMESTERS (2 Years)

Course Structure of M.Sc. (Ag.) SOIL SCIENCE & AGRICULTURAL CHEMISTRY

I SEMESTER

Course Details				Theory Assessment		Internal Assessment				Credit Distribution			Credits
				Major		Sessional		Practical					
Course Code	Course Type	Course Title	Total Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	L	T	P	
MSOS20S501	Major Course	Soil Fertility and Fertilizer Use	150	80	48	20	12	50	30	3	_	1	4(3+1)
MSOS20S502	Major Course	Soil Chemistry	150	80	48	20	12	50	30	2	_	1	3(2+1)
MSOS20S503	Major Course	Fertilizer Technology	100	80	48	20	12	_	_	1	_	0	1(1+0)
MAGR20S503	Minor Course	Dryland Farming	150	80	48	20	12	50	30	2	_	1	3(2+1)
MPPH20S502	Minor Course	Physiological and Molecular Responses of Plants to Abiotic Stresses	150	80	48	20	12	50	30	2	_	1	3(2+1)
MSTA20S511	Supporting Course	Statistical Methods in Applied Sciences	150	80	48	20	12	50	30	3	_	1	4(3+1)
MPGS20S501	Non-Credit Course	Library and Information Services	50	_	_	_	_	50	30	0	_	1	1(0+1)
MPGS20S502	Non-Credit Course	Basic Concepts in Laboratory Techniques	50	_	_	_	_	50	30	0	_	1	1(0+1)
MPGS20S507	Non-Credit Course	Human Values and Professional Ethics	150	80	48	20	12	50	30	1		1	2(1+1)
MPGS20S506	Non-Credit Course	Intellectual Property and Its Management in Agriculture	100	80	48	20	12	_	_	1	_	0	1(1+0)
	Grand Total		**1200**							**15**		**8**	**23(15+8)**

Minimum Passing Marks = 60%

Major- Term End Theory Exam

Minor- Pre University Test

L- Lectures T- Tutorials P- Practical

SCHEME : SCHOOL OF AGRICULTURE

COURSE: MASTER OF SCIENCE (AGRICULTURE)

BRANCH: SOIL SCIENCE & AGRICULTURAL CHEMISTRY

DURATION: 4 SEMESTERS (2 Years)

II SEMESTER

Course Details				Theory Assessment		Internal Assessment				Credit Distribution			Credits
				Major		Sessional		Practical					
Course Code	Course Type	Course Title	Total Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	L	T	P	
MSOS20S504	Major Course	Soil Physics	150	80	48	20	12	50	30	2	–	1	3(2+1)
MSOS20S505	Major Course	Soil Minerology, Genesis, Classification and Survey	150	80	48	20	12	50	30	2	–	1	3(2+1)
MSOS20S506	Major Course	Soil Biology and Biochemistry	150	80	48	20	12	50	30	2	–	1	3(2+1)
MSOS20S507	Major Course	Soil, Water and Air Pollution	150	80	48	20	12	50	30	2	–	1	3(2+1)
MAGR20S507	Minor Course	Principles and Practices of Organic Farming	150	80	48	20	12	50	30	2	–	1	3(2+1)
MSTA20S512	Supporting Course	Statistics - II Experimental Design	150	80	48	20	12	50	30	2	–	1	3(2+1)
MPGS20S503	Non-Credit Course	Agriculture Research, Research Ethics and Rural Development	100	80	48	20	12	–	–	1	–	0	1(1+0)
MPGS20S504	Non-Credit Course	Disaster Management	100	80	48	20	12	–	–	1	–	0	1(1+0)
MPGS20S505	Non-Credit Course	Technical Writing and Communication Skills	50	–	–	–	–	50	30	0	–	1	1(0+1)
	Grand Total		**1150**							**14**		**7**	**21(14+7)**

L- Lectures T- Tutorials P- Practical

Minimum Passing Marks = 60%

Major- Term End Theory Exam

Minor- Pre University Test

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SCHOOL OF AGRICULTURE

M.Sc. (Ag.)

Soil Science & Agricultural Chemistry

Semester – I

Course	Course Title	Subject Code	Credits
Major course	Soil Fertility and Fertilizer Use	MSOS20S501	4(3+1)
	Soil Chemistry	MSOS20S502	3(2+1)
	Fertilizer Technology	MSOS20S503	1(1+0)
Minor courses	Dryland Farming and Watershade Management	MAGR20S503	3(2+1)
	Physiological and Molecular Responses of Plants to Abiotic Stresses	MPPH20S502	3(2+1)
Supporting courses	Statistical methods for applied sciences	MSTA20S511	4(3+1)
Non-credit compulsory courses	Library and Information Services	MPGS20S501	1(0+1)
	Basic Concepts in LaboratoryTechniques	MPGS20S502	1(0+1)
	Human Values and Professional Ethics	MPGS20S507	2(1+1)
	Intellectual Property and Its Management in Agriculture	MPGS20S506	1(1+0)

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Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalanal Adhyadesh) 2020

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Soil fertility and fertilizer use	
Subject Code			MSOS20S501	
L	T	P	Credit Total	4(3+1)
3	0	1		

Course Objectives: The course is aimed at

1. Imparting knowledge on soil manures and fertilizers.
2. Providing a clear understanding on nutrient application and its management.
3. Describing basic concepts of soil fertility, soil chemistry and its response to plants.

Expected Course Outcome: At the end of the course the student should be able to

1. Comprehend the utility of manures.
2. Interpret the importance of varied forms of plant fertilizers.
3. Interpret deficiency and toxicity symptoms of nutrients in plants.
4. Describe fertility status of soil.
5. Deduce fertilizer application methods based on plant and soil analysis.
6. Estimate plant and soil nutrients and provide recommendations.

Unit	Syllabus	Periods
UNIT 1	Soil fertility and soil productivity; nutrient sources-fertilizers and manures; essential plant nutrients - functions and deficiency symptoms. 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.	10
UNIT 2	Soil and fertilizer phosphorus-forms, immobilization, mineralization, reactionsin 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.	10
UNIT 3	Sulphur-source, forms, fertilizers and their behavior in soils; calcium and magnesium– factors affecting their availability in soils; management of sulphur, calcium and magnesium fertilizers. Micronutrients – critical limits in soils and plants; factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability.	10
UNIT 4	Common soil test methods for fertilizer recommendations; quantity– intensity relationships; soil test crop response correlations and response functions. Fertilizer use efficiency; blanket fertilizer recommendations–usefulness and limitations; site-specific nutrient management; plant need based nutrient management; integrated nutrient management.	10
UNIT 5	Soil fertility evaluation- biological methods, soil, plant and tissue tests; soilquality in relation to sustainable agriculture.	5

Practical (30 periods)

Principles of colorimetry. Flame-photometry and atomic absorption spectroscopy. Chemical analysis of soil for total and available nutrientsAnalysis of plants for essential elements.

Text Books

1. Ranjan Kumar Basak. 2016. Fertilizers: A Text Book. 4th edition, Kalyani publishers, India.
2. Havlin, J.L., Tisdale, S.L., Nelson, W.L. and J.D. Beaton. 2016. Soil Fertility and Fertilizers. 8th edition, Pearson Education, India.

Reference Books

1. Dhyan Singh, P.K. Chhonkar and B.S. Dwivedi. 2015. Manual on soil, plant and water analysis. Westvill Publishing House, India.
2. Soil Science: An Introduction. 2015. Indian Society of Soil Science (ISSS). India.
3. Das, D.K. 2015. Introductory Soil Science. 4th edition, Kalyani Publishers, India.

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SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Soil chemistry	
Subject Code			MSOS20S502	
L	T	P	Credit Total	3(2+1)
3	0	1		

Course Objectives: The course is aimed at

1. To introduce the classical concepts of soil chemistry.
2. To familiarize students with modern developments in chemistry of soils in relation to using soils as a medium for plant growth.
3. To know nutrient uptake by plants from soil.

Expected Course Outcome: At the end of the course the student should be able to

1. Analysis of soil samples collected from different areas.
2. Develop skills to find out suitable soil for growing different field crops.
3. Analytical techniques and instrumental methods in soil and plant analysis.

Unit	Syllabus	Periods
UNIT 1	Chemical (elemental) composition of the earth's crust and soils. Elements of equilibrium thermodynamics, chemical equilibria, electrochemistry and chemical kinetics.	5
UNIT 2	Soil colloids inorganic and organic colloids - origin of charge, concept of point of zero-charge (PZC) and its dependence on variable-charge soil components, surface charge characteristics of soils; diffuse double layer theories of soil colloids, zeta potential, stability, coagulation/flocculation and peptization of soil colloids; electrometric properties of soil colloids; sorption properties of soil colloids; soil organic matter - fractionation of soil organic matter and different fractions, clay-organic interactions.	8
UNIT 3	Ion exchange processes in soil; cation exchange- theories based on law of mass action (Kerr-Vanselow, Gapon equations, hysteresis, Jenny's concept), adsorption isotherms, donnan-membrane equilibrium concept, clay- membrane electrodes and ionic activity measurement, thermodynamics, statistical mechanics; anion and ligand exchange – innersphere and outer-sphere surface complex formation, fixation of oxyanions, hysteresis in sorption-desorption of oxy-anions and anions, shift of PZC on ligand exchange, AEC, CEC; experimental methods to study ion exchange phenomena and practical implications in plant nutrition.	8
UNIT 4	Potassium, phosphate and ammonium fixation in soils covering specific and non-specific sorption; precipitation-dissolution equilibria; step and constant- rate K; management aspects. Chemistry of acid soils; active and potential acidity; lime potential, chemistryof acid soils; sub-soil acidity.	6
UNIT 5	Chemistry of salt-affected soils and amendments; soil pH, ECe, ESP, SAR and important relations; soil management and amendments. Chemistry and electrochemistry of submerged soils.	3

Practical (30 periods)

Determination of CEC and AEC of soils. Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter. Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method. Potentiometric and conductometric titration of soil humic and fulvic acids. (E4/E6) ratio of soil humic and fulvic acids by visible spectrophotometric studies and the Ä (E4/E6) values at two pH values. Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm Construction of adsorption envelope 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 by BaCl2-TEA method Determination of lime requirement of an acid soil by buffer method Determination of gypsum requirement of an alkali soil

Text Books

1. Bear RE. 1964. Chemistry of the Soil. Oxford and IBH.
2. Bolt GH & Bruggenwert MGM. 1978. Soil Chemistry. Elsevier.
3. Greenland DJ & Hayes MHB. 1981. Chemistry of Soil Processes. John Wiley & Sons.
   Greenland DJ & Hayes MHB. Chemistry of Soil Constituents. John Wiley & Sons.

Reference Books

1. McBride MB. 1994. Environmental Chemistry of Soils. Oxford Univ. Press.
2. Sposito G. 1981. The Thermodynamics of Soil Solutions. Oxford Univ. Press.
3. Sposito G. 1984. The Surface Chemistry of Soils. Oxford Univ. Press.
4. Sposito G. 1989. The Chemistry of Soils. Oxford Univ. Press.
5. Stevenson FJ. 1994. Humus Chemistry. 2nd Ed. John Wiley & Sons.
6. Van Olphan H. 1977. Introduction to Clay Colloid Chemistry. John Wiley & Sons.

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SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Fertilizer technology	
Subject Code			MSOS20S503	
L	T	P	Credit Total	1(1+0)
1	0	0		

Course Objectives: The course is aimed at

1. Imparting knowledge on soil manures and fertilizers.
2. Providing a clear understanding on nutrient application and its management.
3. Describing basic concepts of soil fertility, soil chemistry and its response to plants.

Expected Course Outcome: At the end of the course the student should be able to

1. Comprehend the utility of manures.
2. Interpret the importance of varied forms of plant fertilizers.
3. Interpret deficiency and toxicity symptoms of nutrients in plants.
4. Describe fertility status of soil.
5. Deduce fertilizer application methods based on plant and soil analysis.
6. Estimate plant and soil nutrients and provide recommendations.

Unit	Syllabus	Periods
UNIT 1	Fertilizers – production, consumption and future projections with regard tonutrient use in the country and respective states; fertilizer control order.	4
UNIT 2	Manufacturing processes for different fertilizers using various raw materials,characteristics and nutrient contents.	3
UNIT 3	Recent developments in secondary and micronutrient fertilizers and theirquality control as per fertilizer control order.	3
UNIT 4	New and emerging issues in fertilizer technology – production and use of slowand controlled release fertilizers.	3
UNIT 5	Super granules fertilizers and fertilizers for specific crops / situations.	2

Text Books

1. Prasad R & Power JF. Soil Fertility Management for Sustainable Agriculture. CRC Press.
2. Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. Soil Fertility and Fertilizers. McMillan Publ.

Reference Books

1. Brady NC & Weil RR. 2002. The Nature and Properties of Soils. Pearson Edu. Fertilizer (Control) Order, 1985 and the Essential Commodities Act. FAI New Delhi. Kanwar JS. (Ed.). 1976. Soil Fertility Theory and Practice. ICAR.
2. Olson RA, Army TS, Hanway JJ & Kilmer VJ. 1971. Fertilizer Technology and Use.2[nd] Ed. Soil Sci. Soc. Am. Madison.
3. Vogel AI. 1979. Textbook of Quantitative Inorganic Analysis. ELBS.

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Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Dryland farming and watershed management	
Subject Code			MAGR20S503	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Explaining the problems faced in rainfed agricultural systems.
2. Imparting knowledge on drought management strategies.
3. Describing watershed management techniques.

Expected Course Outcome: At the end of the course the student should be able to

1. Build knowledge on solving problems related to rainfed agriculture.
2. Identify several drought management strategies.
3. Plan crop and water management approaches to mitigate drought.
4. Perceive the necessity and difficulties of watershed management.
5. Recommend practices to be followed in rainfed farming systems.

Unit	Syllabus	Periods
UNIT 1	Definition, concept and characteristics of dry land farming; dry land versusrainfed farming; significance and dimensions of dry land farming in Indian agriculture.	3
UNIT 2	Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.	6
UNIT 3	Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.	6
UNIT 4	Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage;concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.	10
UNIT 5	Concept of watershed resource management, problems, approach andcomponents.	5

Practical (30 Periods)

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

Text Books

1. Singh RP. 1988. Improved Agronomic Practices for Dry land Crops. CRIDA.
2. Singh RP. 2005. Sustainable Development of Dry land Agriculture in India. Scientific Publ.

Reference Books

1. Singh SD. 1998. Arid Land Irrigation and Ecological Management. Scientific Publishers.
2. Venkateshwarlu J. 2004. Rainfed Agriculture in India. Research and Development Scenario. ICAR.

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SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Physiological and molecular responses of plants to abiotic stresses	
Subject Code			MPPH20S503	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. To impart knowledge about physiological of abiotic stress factors.
2. To impart knowledge about molecular aspects of abiotic stress factors.
3. To impart knowledge about molecular aspects of carbon reduction cycle and nitrogen assimilation.

Expected Course Outcome: At the end of the course the student should be able to

1. Increment the knowledge of biochemistry of biotic and abiotic stresses in plants.
2. To update knowledge on the recent research trends in the field of biotic and abiotic stress management in horticultural crops.

Unit	Syllabus	Periods
UNIT 1	Response of plants to abiotic stresses Abiotic stresses affecting plant productivity. Basic principles of a crop improvement programme under stress, Interactions between biotic and abiotic stresses. Drought-characteristic features, Water potential in the soil-Plant air continuum. Development of water deficits, energy balance concept.	5
UNIT 2	Transpiration and its regulation – stomatal functions. Physiological processes affected by drought. Drought resistance mechanisms Escape Dehydration postponement (Drought avoidance), Dehydration tolerance and characteristics of resurrection plants. Osmotic adjustment, Osmoprotectants, Stress proteins. Water use efficiency as a drought resistant trait.	8
UNIT 3	Molecular responses to water deficit Stress perception, Expression of regulatory and functional genes and significance of gene products. Stress and hormones- ABA as a signaling molecule- Cytokinin as a negative signal. Oxidative stress Reactive Oxygen Species (ROS). Role of scavenging systems (SOD catalase etc.).	8
UNIT 4	High temperature stress Tolerance mechanisms- role of membrane lipids in high temperature tolerance. Functions of HSP's. Chilling stress Effects on physiological processes. Crucial role of membrane lipids.	4
UNIT 5	Salinity Species variation in salt tolerance. Salinity effects at – Cellular and whole plant level, tolerance mechanisms. Salt tolerance in – Glycophytes and halophytes, Breeding for salt resistance. Heavy metal stress Aluminium and cadmium toxicity in acid soils. Role of Phytochelatins (heavy metal binding proteins).	5

Practical (30 periods)

Measurement of water status of plants, determination of osmotic potential by vapour pressure and freezing point depression. Determination of soil water potential and content by psychrometry and other systems. Stress imposition and quantification, Stress –stomatal conductance. Canopy temperature as a reflection of transpiration and root activity, Water use – efficiency, Determination at whole plant and single leaf level, Root- shoot signals-ABAand cytokinin effect on stomatal behavior. Heat tolerance and membrane integrity. Sullivans heat tolerance test, chilling tolerance. Galactolipase and free fatty acid levels as biochemical markers for chilling damage, Cold induced inactivation of O2 evolution of chloroplasts- as a screening technique for chilling tolerance.

Text Books

1. Gupta U.S. 1990. *Physiological Aspects of Dry Farming*.
2. Mussell, H & Staples, R. 1979. *Stress Physiology in Crop Plants*. Wiley Inter. Science. Nickell, L.G. 1983. *Plant Growth Regulating Chemicals*. CRC.
3. Peter, K.V. (Ed.). 2008. *Basics of Horticulture*. New India Publ. Agency.
4. Turener, N.C & Kramer, P.J. 1980. *Adaptation of Plants to Water and High Temperature Stress*. John Wiley & Sons.

Reference Books

1. Hopkins WG & Huner NPA. 2004. Introduction to Plant Physiology. John Wiley & Sons.
2. Salisbury FB & Ross C. 1992. Plant Physiology. 4th Ed. Wadsworth Publ.
Taiz L & Zeiger E. 2006. Plant Physiology. 4th Ed. Sinauer Associates.

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SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Statistical methods for applied sciences	
Subject Code			MSTA20S511	
L	T	P	Credit Total	4(3+1)
3	0	1		

Course Objectives: The course is aimed at

1. Explaining the role of statistics in agriculture.
2. Imparting knowledge on collection, analysis and presentation of data.
3. Interpreting simple agricultural experiments.

Expected Course Outcome: After completing the course, the student should be able to

1. Present and analyze scientific data.
2. Solve problems on probability.
3. Interpret statistical test outcomes.
4. Design and analyze experiments.
5. Appreciate the applications of statistical methods in science and engineering.
6. Apply relevant statistical analysis to experimental data.

Unit	Syllabus	Periods
UNIT 1	Classification, tabulation and graphical representation of data. Box-plot,Descriptive statistics. Exploratory data analysis; Theory of probability.Random variable and mathematical expectation.	5
UNIT 2	Discrete and continuous probability distributions Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions 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	8
UNIT 3	Introduction to theory of estimation and confidence-intervals. Correlation and regression. Simple and multiple linear regression model, estimation of parameters, predicted values and residuals, correlation, partial correlation coefficient, multiple correlation coefficient, rank correlation, test of significance of correlation coefficient and regression coefficients. Coefficient of determination. Polynomial regression models and their fitting. Probit regression analysis by least squares and maximum likelihood methods, confidence interval for sensitivity; Testing for heterogeneity.	12
UNIT 4	Non-parametric tests-sign, Wilcoxon, Mann-Whitney U-test, Wald Wolfowitz run test, Run test for the randomness of a sequence. Median test, Kruskal- Wallis test, Friedman two-way ANOVA by ranks. Kendall's coefficient of concordance.	7
UNIT 5	Introduction to multivariate analytical tools- Hotelling's T2 Tests of hypothesisabout the mean vector of a multinormal population. Classificatory problems and discriminant function, D2-statistic and its applications; Cluster analysis, principal component analysis, canonical correlations and Factor analysis.	8

Practical (30 Periods)

Exploratory data analysis, Box-Cox plots; Fitting of distributions~Binomial, Poisson, Negative Binomial, Normal. Large sample tests, testing of hypothesis based on exact sampling distributions~chi square, t and F; Confidence interval estimation and point estimation of parameters of binomial, Poisson and Normal distribution. Correlation and regression analysis, fitting of orthogonal polynomial regression; applications of dimensionality reduction and discriminant function analysis; Nonparametric tests.

Text Books

1. Rangaswamy, R. 2016. A textbook of agricultural statistics. New Age International (P) Ltd., India.
2. Gupta, B.N. 2015. Statistical Analysis. SBPD Publications, India.

Reference Books

1. Peck, R., C. Olsen and J.L. Devore. 2008. Introduction to Statistics and Data Analysis, 5th edition. Brooks Cole Publishing Company, USA.
2. Salk and, N.J. 2016. Statistics for People Who (Think They) Hate Statistics. 6th Edition. Sage Publications. India.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Library and information services	
Subject Code			MPGS20S501	
L	T	P	Credit Total	1(0+1)
0	0	1		

Course Objectives: The course is aimed at

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

Expected Course Outcome: After completing the course, the student should be able to

1. Creation good librarians who can manage and handle a big library.

Practical (30 Periods)

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.

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Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Basic concepts in laboratory techniques	
Subject Code			MPGS20S502	
L	T	P	Credit Total	1(0+1)
0	0	1		

Course Objectives: The course is aimed at

1. Describing the importance of plant tissue culture.
2. Imparting knowledge on the applications and commercial importance of *in vitro* propagation.
3. Introducing the role of tissue culture in plant breeding.

Expected Course Outcome: At the end of the course the student should be able to

1. Understand how *in vitro* culture originated and appreciate its applications.
2. Comprehend the various types of plant tissue culture and its importance.
3. Demonstrate mass multiplication of micropropagules.
4. Apply tissue culture techniques in crop improvement.
5. Examine the demands of the plant tissue culture industry.
6. Practice plant tissue culture techniques and become an entrepreneur.

Practical (15 Periods)

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, sand bath, water bath, 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

Text Books

1. Chawala H.S. 2000. Introduction to Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd.
2. Chopra VL & Nasim A. 1990. *Genetic Engineering and Biotechnology: Concepts, Methods and Applications*. Oxford & IBH.
3. Gupta PK. 1997. *Elements of Biotechnology*. Rastogi Publ.
4. Singh BD. 2005. *Biotechnology, Expanding Horizons*. Kalyani.

Reference Books

1. Hackett PB, Fuchs JA & Messing JW. 1988. An Introduction to Recombinant DNA Technology - Basic Experiments in Gene Manipulation. 2[nd] Ed. Benjamin Publ. Co.
2. Sambrook J & Russel D. 2001. Molecular Cloning - a Laboratory Manual. 3rd Ed. Cold Spring Harbor Lab. Press.

Semester – II

Course	Course title	Subject Code	Credit
Major courses	Soil Physics	MSOS20S504	3(2+1)
	Soil Mineralogy, Genesis, Classification and Survey	MSOS20S505	3(2+1)
	Soil Biology & Biochemistry	MSOS20S506	3(2+1)
	Soil, Water and Air Pollution	MSOS20S507	3(2+1)
Minor courses	Principles and Practices of Organic Farming	MAGR20S507	3(2+1)
Supporting courses	Statistics – II Experimental Design	MSTA20S512	3(2+1)
Non-credit compulsory courses	Agricultural Research, Research Ethics and Rural Development Programs	MPGS20S503	1(1+0)
	Disaster Management	MPGS20S504	1(1+0)
	Technical Writing and Communication Skills	MPGS20S505	1(0+1)

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			Ist Year, 2nd Semester	
Department			Soil Science & Agricultural Chemistry	
Paper nAME			Topic Seminar	
Subject Code			MATS20S501	
L	T	P	Credit Total	1(0+1)
0	0	1		

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Soil physics	
Subject Code			MSOS20S504	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives

1. To impart basic knowledge about soil physical properties and processes in relation to plant growth.
2. To provide knowledge about the measurement of soil-water content, soil-water potential.
3. To determine soil-moisture characteristics curve and computation of pore-size distribution.

Expected Course Outcome:

1. Develop skills to analyze soil physical properties play important role in plant growth.
2. To create experts of soil physics who will help in the measurement and analysis of soil.

Unit	Syllabus	Periods
UNIT 1	Scope of soil physics and its relation with other branches of soil science; soilas a three phase system. Soil texture, textural classes, mechanical analysis, specific surface.	5
UNIT 2	Soil consistence; dispersion and workability of soils; soil compaction and consolidation; soil strength; swelling and shrinkage - basic concepts. Soil structure-genesis, types, characterization and management soil structure; soil aggregation, aggregate stability; soil tilth, characteristics of good soil tilth; soil crusting - mechanism, factors affecting and evaluation; soil conditioners; puddling, its effect on soil physical properties; clod formation.	8
UNIT 3	Soil water content and potential, soil water retention, soil-water constants, measurement of soil water content, energy state of soil water, soil water potential, soil-moisture characteristic curve; hysteresis, measurement of soil- moisture potential.	6
UNIT 4	Water flow in saturated and unsaturated soils, Poiseuille's law, Darcy's law;hydraulic conductivity, permeability and fluidity, hydraulic diffusivity; measurement of hydraulic conductivity in saturated and unsaturated soils. Infiltration; internal drainage and redistribution; evaporation; hydrologic cycle, field water balance; soil-plant-atmosphere continuum	5
UNIT 5	Composition of soil air; renewal of soil air - convective flow and diffusion; measurement of soil aeration; aeration requirement for plant growth; soil air management. Modes of energy transfer in soils; energy balance; thermal properties of soil; measurement of soil temperature; soil temperature in relation to plant growth; soil temperature management.	4

Practical (30 periods)

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

Text Books

1. Ghildyal BP & Tripathi RP. 2001. Soil Physics. New Age International.
2. Saha AK. 2004. Text Book of Soil Physics. Kalyani.
3 Lal R & Shukla MK. 2004. Principles of Soil Physics. Marcel Dekker.
4. Indian Society of Soil Science. 2002. Fundamentals of Soil Science. ISSS, New Delhi.

Reference Books

1. Hillel D. 1998. Environmental Soil Physics. Academic Press.
2. Hillel D. 2003. Introduction to Environmental Soil Physics. Academic Press.
3. Kirkham D & Powers WL. 1972. Advanced Soil Physics. Wiley- Interscience.
4. Kohnke H. 1968. Soil Physics. McGraw Hill.
5. Oswal MC. 1994. Soil Physics. Oxford & IBH.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Soil mineralogy, genesis, classification and survey	
Subject Code			MSOS20S505	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives

1. To impart knowledge about modern concepts of different types of soil.
2. To emphasis understanding the processes involved with practical significance.
3. To give knowledge of classification of soil, environmental factors affecting of soils.

Expected Course Outcome:

1. Develop skills to identification of different types of soil.
2. To develop skills to analyze soil crystallography.

Unit	Syllabus	Periods
UNIT 1	Fundamentals of crystallography, space lattice, coordination theory,isomorphism and polymorphism.	4
UNIT 2	Classification, structure, chemical composition and properties of clayminerals; genesis and transformation of crystalline and non-crystalline clay minerals; identification techniques; amorphous soil constituents and other non-crystalline silicate minerals and their identification; clay minerals in Indiansoils.	7
UNIT 3	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.	5
UNIT 4	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.	4
UNIT 5	Soil survey and its types; soil survey techniques-conventional and modern; soil series-characterization and procedure for establishing soil series; benchmark soils and soil correlations; soil survey interpretations; soil mapping, thematic soil maps, cartography, mapping units, techniques for generation of soil maps. Landform-soil relationship; major soil groups of India with special reference to respective states; land capability classification and land irrigability classification; land evaluation and land use type (LUT) – concept and application; approaches for managing soils and landscapes in the framework of agro-ecosystem.	10

Practical (30 periods)

Identification and quantification of minerals in soil fractions. Morphological properties of soil profile in different landformsClassification of soils using soil taxonomy. Calculation of weathering indices and its application in soil formationGrouping soils using available data base in terms of soil quality Aerial photo and satellite data interpretation for soil and land use. Cartographic techniques for preparation of base maps and thematic maps, processing offield sheets, compilation and obstruction of maps in different scales. Land

use planning exercises using conventional and RS tools

Text Books

1. Indian Society of Soil Science 2002. Fundamentals of Soil Science. ISSS, New Delhi.
2. Sehgal J. 2002. Introductory Pedology Concepts and Applications. New Delhi
3. Sehgal J. 2002. Pedology - Concepts and Applications. Kalyani.

Reference Books

1. Brady NC & Weil RR. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu. Buol EW, Hole ED, MacCracken RJ & Southard RJ. 1997. Soil Genesis and Classification. 4th Ed. Panima Publ.
2. Wilding LP & Smeck NE. 1983. Pedogenesis and Soil Taxonomy II. The Soil Orders. Elsevier.
3. Wilding NE & Holl GF. (Eds.). 1983. Pedogenesis and Soil Taxonomy. I. Concept and Interaction. Elsevier.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I st Year, 2nd Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Soil biology and biochemistry	
Subject Code			MSOS20S506	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Imparting knowledge on soil manures and fertilizers.
2. Providing a clear understanding on nutrient application and its management.
3. Describing basic concepts of soil fertility, soil chemistry and its response to plants.

Expected Course Outcome: At the end of the course the student should be able to

1. Comprehend the utility of manures.
2. Interpret the importance of varied forms of plant fertilizers.
3. Interpret deficiency and toxicity symptoms of nutrients in plants.
4. Describe fertility status of soil.
5. Deduce fertilizer application methods based on plant and soil analysis.
6. Estimate plant and soil nutrients and provide recommendations.

Unit	Syllabus	Periods
UNIT 1	Soil biota, soil microbial ecology, types of organisms in different soils; soilmicrobial biomass; microbial interactions; un-culturable soil biota. Microbiology and biochemistry of root-soil interface; phyllosphere; soil enzymes, origin, activities and importance; soil characteristics influencinggrowth and activity of microflora.	8
UNIT 2	Microbial transformations of nitrogen, phosphorus, sulphur, iron and manganese in soil; biochemical composition and biodegradation of soil organic matter and crop residues, humus formation; cycles of important organic nutrients.	8
UNIT 3	Biodegradation of pesticides, organic wastes and their use for production of biogas and manures; biotic factors in soil development; microbial toxins in the soil.	6
UNIT 4	Preparation and preservation of farmyard manure, animal manures, rural andurban composts and vermicompost.	5
UNIT 5	Biofertilizers–definition, classification, specifications, method of productionand role in crop production.	3

Practical (30 periods)

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

Text Books

1. Ranjan Kumar Basak. 2016. Fertilizers: A Text Book. 4th edition, Kalyani publishers, India.
2. Havlin, J.L., Tisdale, S.L., Nelson, W.L. and J.D. Beaton. 2016. Soil Fertility and Fertilizers. 8th edition, Pearson Education, India.
3. Reddy MV. (Ed.). Soil Organisms and Litter in the Tropics. Oxford & IBH.

Reference Books

1. Alexander M. 1977. Introduction to Soil Microbiology. John Wiley & Sons.Burges A & Raw F. 1967. Soil Biology. Academic Press.
2. McLaren AD & Peterson GH. 1967. Soil Biochemistry. Vol. XI. Marcel Dekker.
3. Metting FB. 1993. Soil Microbial Ecology–Applications in Agricultural and Environmental Management. Marcel Dekker.
4. Paul EA & Ladd JN. 1981. Soil Biochemistry. Marcel Dekker.
5. Russel RS. 1977. Plant Root System Their Functions and Interaction with the Soil. ELBS& McGraw Hill.

EKLAVYA UNIVERSITY
ज्ञान प्राप्तये लक्ष्य संधानम्
Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalan) Adhiyadesh, 2020

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Soil, water and air pollution	
Subject Code			MSOS20S507	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Describing the fundamental concepts of soil, air and water pollution.
2. Imparting the knowledge on soil properties, soil water plant relationship and its importance.
3. Stating the various aspects of soil, air, water pollution and substantiating through laboratory experiments.

Expected Course Outcome: At the end of the course the student should be able to

1. State techniques to mitigate soil, air and water pollution.
2. Acquire knowledge on the importance of soil, air and water pollution to agriculture.
3. Classify soil, air and water pollution required for an agricultural field.
4. Analyze polluted soil, water and air.
5. Identify polluted soil, air and water related problems in agricultural fields and provide suitable solutions.

Unit	Syllabus	Periods
UNIT 1	Soil, water and air pollution problems associated with agriculture, nature andextent. 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.	8
UNIT 2	Sewage and industrial effluents–their composition and effect on soilproperties / health, and plant growth and human beings; soil as sink for waste disposal.	6
UNIT 3	Pesticides–their classification, behavior in soil and effect on soil microorganisms. Toxic elements–their sources, behavior in soils, effect on nutrients availability, effect on plant and human health.	6
UNIT 4	Pollution of water resources due to leaching of nutrients and pesticides from soil; emission of greenhouse gases–carbon dioxide, methane and nitrous oxide.	6
UNIT 5	Remediation / amelioration of contaminated soil and water; remote sensing applications in monitoring and management of soil and water pollution.	4

Practical (30 periods)

Sampling of sewage waters, sewage sludge, solid/liquid industrial wastes, polluted soils and plants. Estimation of dissolved and suspended solids, chemical oxygen demand (COD), biological demand (BOD), nitrate and ammoniacal nitrogen and phosphorus, heavy metal content in effluents. Heavy metals in contaminated soils and plants. Management of contaminants in soil and plants to safeguard food safety. Air sampling and determination of particulate matter and oxides of ulphur. Visit to various industrial sites to study the impact of pollutants on soil and plants.

Text Books

1. Lal R, Kimble J, Levine E & Stewart BA. 1995. Soil Management and Greenhouse Effect. CRC Press.
2. Dhruv Narayan VV. 2002. Soil and Water Conservation Research in India. ICAR.Gupta US. (Ed.). 1995. Production and Improvements of Crops for
3. Drylands. Oxford & IBH. Katyal JC & Farrington J. 1995. Research for Rainfed Farming. CRIDA.

Reference Books

1. Middlebrooks EJ. 1979. Industrial Pollution Control. Vol. I. Agro- Industries. John Wiley Interscience.
2. Ross SM. Toxic Metals in Soil Plant Systems. John Wiley & Sons.
3. Vesilund PA & Pierce 1983. Environmental Pollution and Control. Ann Arbor Science Publ.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Principles and practices of organic farming	
Subject Code			MAGR20S507	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Imparting knowledge on the scope and concepts of organic farming in India.
2. Discussing on indigenous weed, pest, disease and nutrient management for organic farming.
3. Educating students on the certification and marketing of organic farm produces.

Expected Course Outcome: At the end of the course the student should be able to

1. Analyze the scope of organic farming.
2. Recommend varieties suitable for organic farming.
3. Comprehend management practices suitable for organic farming.
4. Understand processing and marketing of organic products.
5. Develop entrepreneur skills and ideas to practice organic farming.

Unit	Syllabus	Periods
UNIT 1	Organic farming - concept and definition, its relevance to India and global agriculture and future prospects; land and water management - land use, minimum tillage; shelter zones, hedges, pasture management, agro-forestry.	8
UNIT 2	Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures and biofertilizers	10
UNIT 3	Farming systems, crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.	5
UNIT 4	Control of weeds, diseases and insect pest management, biological agentsand pheromones, biopesticides.	3
UNIT 5	Socio-economic impacts; marketing and export potential inspection, certification, labeling and accreditation procedures; organic farming and national economy.	4

Practical (30 periods)

Aerobic and anaerobic methods of making compostMaking of vermicompost. Identification and nursery raising of important agro-forestry trees and tress for shelterbelts. Efficient use of biofertilizers, technique of treating legume seeds with Rhizobium cultures, use of Azotobacter, Azospirillum, and PSB cultures in field • Visit to an organic farm. Quality standards, inspection, certification and labeling and accreditation procedures for farm produce from organic farms.

Text Books

1. Sarath Chandran, Unni M.R and Sabu Thomas. 2018. Organic farming. Woodhead Publishing, UK.

2. Reddy, S.R.2017. Principles of organic farming. Kalyani publishers, India.

Reference Books

1. Ranjan Kumar Biswas. 2014. Organic farming in India. New Delhi Publishers, India.
2. Peter Fossel. 2014. Organic Farming: How to Raise, Certify, and Market Organic Crops and Livestock. Reprint edition, Voyageur Press, USA.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Experimental designs	
Subject Code			MSTA20S512	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Explaining the role of statistics in agriculture.
2. Imparting knowledge on collection, analysis and presentation of data.
3. Interpreting simple agricultural experiments.

Expected Course Outcome: After completing the course, the student should be able to

1. Present and analyze scientific data.
2. Solve problems on probability.
3. Interpret statistical test outcomes.
4. Design and analyze experiments.
5. Appreciate the applications of statistical methods in science and engineering.
6. Apply relevant statistical analysis to experimental data.

Unit	Syllabus	Periods
UNIT 1	Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control.	5
UNIT 2	Uniformity trials, size and shape of plots and blocks; Analysis of variance; Completely randomized design, randomized block design and Latin square design.	5
UNIT 3	Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom, Confounding in symmetrical factorial experiments, Factorial experiments with control treatment.	7
UNIT 4	Split plot and strip plot designs; Analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, crossover designs, balanced incomplete block design, resolvable designs and their applications ~ Lattice design, alpha design-concepts, randomisation procedure, analysis and interpretation of results. Response surfaces.Experiments with mixtures.	10
UNIT 5	Bioassays- direct and indirect, indirect assays based on quantal dose response, parallel line and slope ratio assays potency estimation.	3

Practical (30 periods)

Uniformity trial data analysis, formation of plots and blocks, Fairfield Smith Law; Analysis of data obtained from CRD, RBD, LSD. Analysis of factorial experiments without and with confounding. Analysis with missing data; Split plot and strip plot designs; Transformation of data.Analysis of resolvable designs. Fitting of response surfaces.

Text Books

1. Rangaswamy, R. 2016. A textbook of agricultural statistics. New Age International (P) Ltd., India.
2. Gupta, B.N. 2015. Statistical Analysis.SBPD Publications, India.

Reference Books

1. Cochran WG & Cox GM. 1957. Experimental Designs. 2nd Ed. John Wiley. Dean AM & Voss D. 1999. Design and Analysis of Experiments. Springer. Federer WT. 1985. Experimental Designs. MacMillan.
2. Fisher RA. 1953. Design and Analysis of Experiments. Oliver & Boyd.

Class			M.Sc. (Agriculture)	
Year/Semester			I st Year, 2nd Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Agricultural research, research ethics and rural development programmes	
Subject Code			MPGS20503	
L	T	P	Credit Total	1(1+0)
1	0	0		

Course Objectives: The course is aimed at

1. To enlighten the students about the organization and functioning of agricultural research systems at national and international levels.
2. To learn research ethics related to agriculture.
3. To give knowledge about rural development programmes and policies of Government.

Expected Course Outcome: After completing the course, the student should be able to

1. Develop skills to govern all the agricultural research programmes.
2. Knowledge about research ethics, research integrity, research safety in laboratories, welfare of animals used in research.

Unit	Syllabus	Periods
UNIT 1	History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National AgriculturalResearch Systems (NARS) and Regional Agricultural Research Institutions.	8
UNIT 2	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.	10
UNIT 3	Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.	5
UNIT 4	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,	3
UNIT 5	Integrated Rural Development Programme(IRDP) Panc	4

Text Books

1. Bhalla GS & 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.

References Books

1. Rao BSV. 2007. Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives. Mittal Publ.
2. Singh K.. 1998. Rural Development-Principles, Policies and Management. Sage Publ.

EKLAVYA UNIVERSITY
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Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalanal Adhyadesh) 2020

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Disaster management	
Subject Code			MPGS20S504	
L	T	P	Credit Total	1(1+0)
1	0	0		

Course Objectives: The course is aimed at

1. To introduce learners to the key concepts and practices of natural disaster management.
2. To equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building.

Expected Course Outcome:

1. Previously predict natural disasters when these come.
2. Management of natural disasters through different scientific approaches.

Unit	Syllabus	Periods
UNIT 1	Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches,	3
UNIT 2	Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion	2
UNIT 3	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.	5
UNIT 4	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,	3
UNIT 5	Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.	2

Text Books

1. Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.
2. Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India.

Reference Books

1. Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.

SCHEME : SCHOOL OF AGRICULTURE

COURSE: MASTER OF SCIENCE (AGRICULTURE)

BRANCH: SOIL SCIENCE & AGRICULTURAL CHEMISTRY

DURATION: 4 SEMESTERS (2 Years)

Course Structure of M.Sc. (Ag.) SOIL SCIENCE & AGRICULTURAL CHEMISTRY

III SEMESTER

Course Details				Theory Assessment		Internal Assessment				Credit Distribution			Credits
				Major		Sessional		Practical					
Course Code	Course Type	Course Title	Total Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	L	T	P	
MACM20S501	Non-Credit Course	Comprehensive - Major	100	100	60	SATISFACTORY / UNSATISFACTORY							
MACN20S502	Non-Credit Course	Comprehensive - Minor	100	100	60	SATISFACTORY / UNSATISFACTORY							
MASE20S501	Practical	Master Seminar	50	–	-	-	-	50	30	0		1	1(0+1)
MARE20S501	Non-Credit Course	Master Research	UNDER PROCESS							-	-	-	
	Grand Total		**250**							**0**		**1**	

Course Structure of M.Sc. (Ag.) SOIL SCIENCE & AGRICULTURAL CHEMISTRY

IV SEMESTER

MARE20S501	Non-Credit Course	Master Research	UNDER PROCESS/THESIS ACCEPTED							-	-	-	
	Grand Total												

Semester – III

Course Type	Course Title	Subject Code	Credits
Non – Credit Course	Comprehensive - Major	MACM20S501	-
	Comprehensive - Minor	MACN20S502	-
	Master's Research	MARE20S501	-
Practical	Master Seminar	MASE20S501	1(0+1)

EKLAVYA UNIVERSITY
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Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalan) Adhyadesh, 2020

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			2nd Year, IIIrd Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Technical Writing and Communications Skills	
Subject Code			MPGS20S505	
L	T	P	Credit Total	1(0+1)
0	0	1		

Course Objectives: The course is aimed at

1. Enhancing communication skills in English.
2. Developing writing skills and improving vocabulary.
3. Imparting knowledge on developing presentation skills.

Expected Course Outcome: At the end of the course the student should be able to

1. Analyze grammatical errors.
2. Identify correct pronunciation.
3. Express writing skills.
4. Comprehend the course materials of all courses and improve oral communication skills.
5. Demonstrate presentation skills.
6. Illustrate communication skills.

Practical (30 periods)

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.

Text Books

1. Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.
2. Mohan K. 2005. Speaking English Effectively. MacMillan India. Richard WS. 1969. Technical Writing. Barnes & Noble.

Reference Books

1. Gordon HM & Walter JA. 1970. Technical Writing. 3 Ed. Holt,
2. Rinehart & Winston. Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6 Ed. Oxford University Press.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			2nd Year, IIIrd Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Intellectual Property and its Management in Agriculture	
Subject Code			MPGS20S506	
L	T	P	Credit Total	1(1+0)
1	0	0		

Course Objectives: The course is aimed at

1. To introduce the classical concepts of soil chemistry.
2. To familiarize students with modern developments in chemistry of soils in relation to using soils as a medium for plant growth.
3. To know nutrient uptake by plants from soil.

Expected Course Outcome: At the end of the course the student should be able to

1. Analysis of soil samples collected from different areas.
2. Develop skills to find out suitable soil for growing different field crops.
3. Analytical techniques and instrumental methods in soil and plant analysis.

Unit	Syllabus	Periods
UNIT 1	Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement.	3
UNIT 2	Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties.	3
UNIT 3	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.	3
UNIT 4	Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity.	3
UNIT 5	International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.	3

Text Books

1. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V. Technology Generation and IPR Issues. Academic Foundation.

Reference Books

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

EKLAVYA UNIVERSITY
ज्ञान प्राप्तये लक्ष्य संधानम्
Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Evam Sanchalanal Adhyadesh, 2020

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			2nd Year, IIIrd Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Master's Research	
Subject Code			MARE20S501	
L	T	P	Credit Total	10(0+10)
0	0	10		

SCHOOL OF AGRICULTURE

Semester – IV

Course Title	Subject Code	Credits
Master's Research	MARE20S501	-

Class			M.Sc. (Agriculture)	
Year/Semester			2nd Year, IVth Semester	
Department			Soil Science & Agricultural Chemistry	
Paper Name			Master's Research	
Subject Code			MARE20S501	
L	T	P	Credit Total	
0	0	0		