SCHEME : SCHOOL OF AGRICULTURE
COURSE: MASTER OF SCIENCE (AGRICULTURE)
BRANCH: AGRONOMY
DURATION: 4 SEMESTERS (2 Years)

Course Structure of M.Sc. (Ag.) AGRONOMY

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	
MAGR20S501	Major Course	Modern Concepts in Crop Production	100	80	48	20	12	_	_	3	_	0	3(3+0)
MAGR20S502	Major Course	Principles and Practices of Soil Fertility and Nutrient Management	150	80	48	20	12	50	30	2	_	1	3(2+1)
MAGR20S503	Major Course	Dryland Farming	150	80	48	20	12	50	30	2	_	1	3(2+1)
MPPH20S501	Minor Course	Principles of Plant Physiology	150	80	48	20	12	50	30	3	_	1	4(3+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		**1050**							**15**		**7**	**22(15+7)**

L- Lectures T- Tutorials P- Practical

Minimum Passing Marks = 60%

Major- Term End Theory Exam

Minor- Pre University Test

SCHEME : SCHOOL OF AGRICULTURE
COURSE: MASTER OF SCIENCE (AGRICULTURE)
BRANCH: AGRONOMY
DURATION: 4 SEMESTERS (2 Years)

Course Structure of M.Sc. (Ag.) AGRONOMY

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	
MAGR20S504	Major Course	Principles and Practices of Weed Management	150	80	48	20	12	50	30	2	_	1	3(2+1)
MAGR20S505	Major Course	Principles and Practices of Water Management	150	80	48	20	12	50	30	2	_	1	3(2+1)
MAGR20S506	Major Course	Cropping Systems and Sustainable Agriculture	100	80	48	20	12	_	_	2	_	0	2(2+0)
MAGR20S507	Major Course	Principles and Practices of Organic Farming	150	80	48	20	12	50	30	2	_	1	3(2+1)
MSOS20S506	Minor Course	Soil Biology and Biochemistry	150	80	48	20	12	50	30	2	_	1	3(2+1)
MSOS20S507	Minor Course	Soil, Water and Air Pollution	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		**1250**							**16**		**7**	**23(16+7)**

Minimum Passing Marks = 60%

Major- Term End Theory Exam

Minor- Pre University Test

L- Lectures T- Tutorials P- Practical

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

SCHOOL OF AGRICULTURE

M.Sc. (Ag.) Agronomy

Semester – I

Course	Course Title	Subject Code	Credits
Major Courses	Modern concepts in crop production	MAGR20S501	3(3+0)
	Principles and practices of soil fertility and nutrient management	MAGR20S502	3(2+1)
	Dryland farming	MAGR20S503	3(2+1)
Minor Courses	Principles of plant physiology	MPPH20S501	4(3+1)
Supporting Courses	Statistical methods in applied sciences	MSTA20S511	4(3+1)
Compulsory Non-Credit Courses	Library and information services	MPGS20S501	1(0+1)
	Basic concepts in laboratory techniques	MPGS20S502	1(0+1)
	Human Values and Professional Ethics	MPGS20S507	2(1+1)
	Intellectual Property and Its Management in Agriculture	MPGS20S506	1(1+0)

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Agronomy	
Paper Name			Modern concepts in crop production	
Subject Code			MAGR20S501	
L	T	P	Credit Total	3(3+0)
3	0	0		

Course Objectives: The course is aimed at

1. Imparting knowledge on different crops, crop nutrition and growth
2. Describing crop-water relations in association to crop growth and development
3. Illustrating crop management, cropping pattern and weed management

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

1. Express knowledge gained on the principles of agronomy
2. Recognize the various nutrients and their effects on plant health
3. Plan irrigation measures for plant growth and development
4. Manage weeds in a field
5. Plan for sustainable agricultural production
6. Apply scientific methods and tools in field preparation and for designing cropping

Unit	Syllabus	Periods
UNIT 1	Crop growth analysis in relation to environment; agro-ecological zones ofIndia.	5
UNIT 2	Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.	10
UNIT 3	Effect of lodging in cereals; physiology of grain yield in cereals; optimization ofplant population and planting geometry in relation to different resources, concept of ideotype plant and crop modeling for desired crop yield.	12
UNIT 4	Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress.	8
UNIT 5	Integrated farming systems, organic farming, and resource conservationtechnology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture.	10

Text Books

1. Yellamanda Reddy, T. and Sankara Reddy, G.H. 2015. Principles of Agronomy. 1st Edition, Kalyani Publishers, Bengaluru.
2. Reddy, S.R. 2014. Introduction to Agronomy and Principles of Crop Production. 1st Edition, Kalyani Publishers, New Delhi.

Reference Books

1. Craig C. Sheaffer and Kristine M. Moncada. 2011. Introduction to Agronomy. 2nd Edition, Delmar Cengage Learning, Australia.
2. Franeisco J. Villalobos and Elias Fereres. 2016. Principles of Agronomy for Sustainable Agriculture, Springer, Mexico.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Agronomy	
Paper Name			Principles and practices of soil fertility and nutrient management	
Subject Code			MAGR20S502	
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 science
2. Imparting the knowledge on soil properties, soil water plant relationship and its importance
3. Stating the various aspects of soil science and substantiating through laboratory experiments

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

1. Acquire knowledge on the importance of soil to agriculture
2. Value the physical properties of soil
3. Classify soil type, soil texture and soil structure required for an agricultural field
4. Analyze soil, water and nutrients related to crop growth
5. State techniques to mitigate soil pollution
6. Identify soil related problems in agricultural fields and provide suitable solutions

Unit	Syllabus	Periods
UNIT 1	Soil fertility and productivity-factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming - basic concepts and definitions.	5
UNIT 2	Criteria of essentiality of nutrients; Essential plant nutrients–their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients.	3
UNIT 3	Preparation and use of farmyard manure, compost, green manures, vermicompost, biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management.	8
UNIT 4	Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions.	7
UNIT 5	Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic manures; economics of fertilizer use; integrated nutrient management; use of vermincompost and residue wastes in crops.	7

Practical (30 Periods)

Determination of soil pH, EC, organic C, total N, available N, P, K and S in soils. Determination of total N, P, K and S in plants. Interpretation of interaction effects and computation of economic and yield optima.

Text Books

1. Gupta US. 1995. Production and Improvements of Crops for Drylands. Oxford& IBH.
2. Katyal JC & Farrington J. 1995. Research for Rainfed Farming. CRIDA.
3. Rao SC & Ryan J. 2007. Challenges and Strategies of Dryland Agriculture. Scientific Publishers.
4. Singh P & Maliwal PL. 2005. Technologies for Food Security and Sustainable Agriculture. Agrotech Publishing Company.

Reference Books

1. Brady NC & Weil R.R 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
2. Fageria NK, Baligar VC & Jones CA. 1991. Growth and Mineral Nutrition of Field Crops. Marcel Dekker.
3. Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. Soil Fertility and Fertilizers. 7thEd. Prentice Hall.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Agronomy	
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 moisture contents. 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.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Agronomy	
Paper Name			Principles of plant physiology	
Subject Code			MPPH20S501	
L	T	P	Credit Total	3(3+0)
3	0	0		

Course Objectives: The course is aimed at

1. Instilling information on basic plant physiological functions, processes and its importance in crop production.
2. Infusing knowledge on growth and development, and to make the students understand how
3. Knowledge about these concepts has led to improved productivity in modern agriculture.
4. Imparting knowledge on remedy measures involved in solving plant physiological problems.

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

1. Define different physiological process at plant and cellular level
2. Summarize mechanisms of uptake, transport and translocation of water and nutrients.
3. Distinguish carbon cycles in plants and define lipid metabolism
4. Relate the importance of growth regulators in plant growth
5. Explain nutrient deficiencies and physiological requirements of plants
6. Interpret and measure plant physiological data

Unit	Syllabus	Periods
UNIT 1	Cell organelles and their physiological functions, structure and physiological functions of cell wall, cell inclusions; cell membrane structure and functions. Soil and plant water relations, water and its role in plants, properties and functions of water in the cell water relations-cell water terminology, water potential of plant cells.	8
UNIT 2	Water loss from plants-Energy balance-Solar energy input-energy dissipation at crop canopy level- evapotranspiration transpiration –Driving force for transpiration, plant factors influencing transpiration rate, Mycorhizal association on water uptake. Stomata structure and function – mechanism of stomatal movement, antitranspirants.	10
UNIT 3	Physiology of water stress in plants: Influence of water stress at cell, organ, plant and canopy levels. Indices for assessment of drought resistance. Uptake of mineral elements in plants – Mechanisms of uptake-translocation of minerals in plants. The role of mineral nutrients in plant metabolism, critical levels, deficiency symptoms, nutrient deficiency and toxicity. Foliar nutrition.	10
UNIT 4	Photosynthesis and its importance in bio productivity. Photochemical process, photochemical reactions, CO2 reduction in Calvin cycle, supplementary pathway of C fixation in C4 and CAM plants and its significance. Photorespiration and its relevance. Photosynthesis as a diffusive process effect of environmental factors on photosynthetic rates, Translocation of photosynthates and its importance in sink growth. Mitochondrial	10

	respiration, growth and maintenance respiration, cyanide resistant respiration and its significance.	
UNIT 5	Nitrogen metabolism: Inorganic nitrogen species (N2, NO3 and NH3) and their reduction to aminoacids, protein synthesis and nucleic acids. Growth and differentiation. Hormonal concept of growth and differentiation, plant growth hormones and their physiological role synthetic growth regulators, growth retardants., Apical dominanace, senescence, fruit growth, abscission. Photo morphogenesis: Photo receptors, phytochrome, cryptochrome, physiology of flowering-Photoperiodism and Vernalisation.	7

Text Books

1. Lincoln Taiz, Eduardo Zeiger, Ian M. Moller, and Angus Murphy. 2018. Plant Physiology and Development, International Sixth Edition. Sinauer; Oxford University Press; USA.
2. Frank B. Salisbury. 2006. Plant physiology. 4th edition. Sinauer Associates, Inc., USA.

Reference Books

1. Mohr, H and P. Schopfer. 1995. Plant physiology, Springer-Verlag, Germany.
2. Buchanan. B. B. 2015. Biochemistry and Molecular Biology of Plants. 2nd Edition. Wiley-Blackwell, USA.
3. Willey, N. 2016. Environmental Plant Physiology, 1st Edition, Garland Science, Taylor and Francis Group, LLC, UK.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Agronomy	
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. Salkand, N. J. 2016. Statistics for People Who (Think They) Hate Statistics. 6th Edition. Sage Publications. India.

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

Course Objectives

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:

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.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, I[st] Semester	
Department			Agronomy	
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 (30 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 toRecombinant DNA Technology - Basic Experiments in Gene Manipulation. 2nd Ed. Benjamin Publ. Co.
2. Sambrook J & Russel D. 2001. Molecular Cloning - a Laboratory Manual. 3rd Ed. Cold Spring Harbor Lab. Press.

SCHOOL OF AGRICULTURE

Semester – II

Course	Course Title	Subject Code	Credit
Major Courses	Principles and practices of weed management	MAGR20S504	3 (2+1)
	Principles and practices of water management	MAGR20S505	3 (2+1)
	Cropping systems and sustainable agriculture	MAGR20S506	2 (2+0)
	Principles and practices of organic farming	MAGR20S507	3 (2+1)
Minor Courses	Soil biology and biochemistry	MSOS20S506	3 (2+1)
	Soil, water and air pollution	MSOS20S507	3 (2+1)
Supporting Courses	Statistics - II Experimental design	MSTA20S512	3 (2+1)
Compulsory Non-Credit Courses	Agricultural research, research ethics and rural development	MPGS20S503	1 (1+0)
	Disaster management	MPGS20S504	1 (0+1)

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
Paper			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			Agronomy	
Paper Name			Principles and practices of weed management	
Subject Code			MAGR20S504	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Identifying major weeds affecting farming ecosystems
2. Imparting knowledge on organic and inorganic herbicides
3. Introducing solutions to manage herbicide resistance

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

1. Gain knowledge on weeds affecting ecosystems
2. Explain the mode of action of herbicides
3. Understand the role of allele-chemicals and the applications of bio-herbicides
4. Analyze herbicide compatibility
5. Cite ways of overcoming herbicide resistance
6. Recommend weed management strategies

Unit	Syllabus	Periods
UNIT 1	Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices.	5
UNIT 2	Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanismof action of herbicides.	7
UNIT 3	Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management; weed control through bio-herbicides, myco-herbicides and allele-phaticchemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation.	10
UNIT 4	Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control.	5
UNIT 5	Integrated weed management; cost benefit analysis of weed management.	3

Practical (30 Periods)

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

Text Book

1. Jaya Kumar, R. and R. Jaganathan. 2016. Weed Science Principles, Kalyani Publishers, India.
2. Gupta, O.P. 2011. Weed management principles and practices. Agrobios, India.

Reference Books

1. Rao, V. S. 2018. Principles of weed science. 3rd edition, CBS Publishers and Distributors, India.
2. Zahid A. Cheema, Muhammad Farooq and Abdul Wahid. 2013. Allelopathy: Current Trends and Future Applications. Springer. Researchco Book Centre, India.

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
Paper Name			Principles and practices of water management	
Subject Code			MAGR20S505	
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	Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.	5
UNIT 2	Soil water movement in soil and plants; transpiration; soil-water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition.	8
UNIT 3	Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; microirrigation system; fertigation; management of water in controlled environments and polyhouses.	8
UNIT 4	Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency.	5
UNIT 5	Excess of soil water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing.	4

Practical (30 Periods)

Measurement of soil water potential by using tensiometer, and pressure plate and membrane apparatus. Soil-moisture characteristics curves, Water flow measurements using different devicesDetermination of irrigation requirements. Calculation of irrigation efficiencies Determination of infiltration characteristics of soil. Determination of saturated/unsaturated hydraulic conductivity.

Text Books

1. Subbareddy, G., Reddy, Y.V.R, Vittal, K.P.R, Thyagaraj, C.R., Ramakrishna, Y.S. and Somani, L.L. 2016. Dryland Agriculture. 2nd Edition, Agrotech Publishing Academy, India.
2. Oswal. M.C. 2017. Watershed Management (for Dryland Agriculture). Associate Publishing Company. India.

Reference Books

1. Humberto Blanco-Canqui and Rattan Lal. 2008. Principles of Soil Conservation and Management. Atlantic Pub. & Distr. (P) Ltd., New Delhi, India.
2. Singh, S.S. 2016. Crop management under rainfed and irrigated condition. Kalyani Publishers, India.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
Paper Name			Cropping systems and sustainable agriculture	
Subject Code			MAGR20S506	
L	T	P	Credit Total	2(2+0)
2	0	0		

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	Cropping systems definition, indices and its importance; physical resources, soil and water management in cropping systems; assessment of land use.	6
UNIT 2	Concept of sustainability in cropping systems and farming systems, scope and objectives; production potential under monoculture, double cropping, multiple cropping, alley cropping, sequential cropping and intercropping, mechanism of yield advantage in intercropping systems.	8
UNIT 3	Above and below ground interactions and allelopathic effects; competition relations; multi-storied cropping and yield stability in intercropping, role of non-monetary inputs and low cost technologies; research need on sustainable agriculture.	8
UNIT 4	Crop diversification for sustainability; role of organic matter in maintenance of soil fertility; crop residue management; fertilizer use efficiency and concept of fertilizer use in intensive cropping system.	5
UNIT 5	Plant ideotypes for drylands; plant growth regulators and their role insustainability.	3

Text Books

1. Subbareddy, G., Reddy, Y.V.R, Vittal, K.P.R, Thyagaraj, C.R., Ramakrishna, Y.S. and Somani, L.L. 2016. Dryland Agriculture. 2[nd] Edition, Agrotech Publishing Academy, India.
2. Oswal. M.C. 2017. Watershed Management (for Dryland Agriculture). Associate Publishing Company. India.

Reference Books

1. Humberto Blanco-Canqui and Rattan Lal. 2008. Principles of Soil Conservation and Management. Atlantic Pub. & Distr. (P) Ltd., New Delhi, India.

2. Singh, S.S. 2016. Crop management under rainfed and irrigated condition. Kalyani Publishers, India.

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
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 compost Making 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			Agronomy	
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; 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.	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 groupsDecomposition of organic matter in soil Soil enzymes. Measurement of important soil microbial processes such as ammonification, nitrification, N_2 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.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
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 sulphur. 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 WileyInterscience.
2. Ross SM. Toxic Metals in Soil Plant Systems. John Wiley & Sons.
3. Vesilund PA & Pierce 1983. Environmental Pollution and Control. Ann Arbor SciencePubl.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
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; nalysis 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.

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
Paper Name			Agricultural research, research ethics and rural development programmes	
Subject Code			MPGS20S503	
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.

Class			M.Sc. (Agriculture)	
Year/Semester			I[st] Year, 2[nd] Semester	
Department			Agronomy	
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

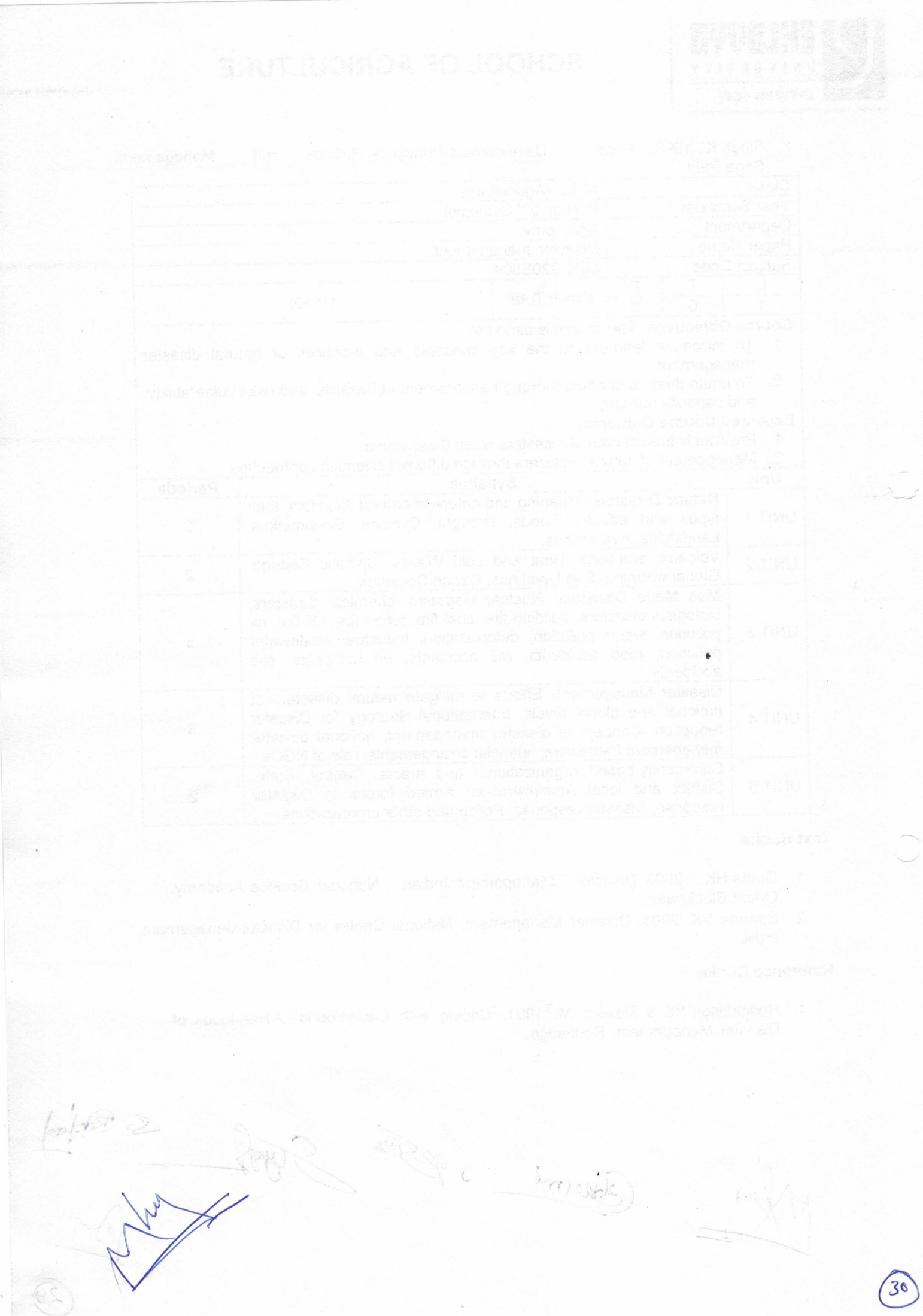
Unit	Syllabus	Periods
UNIT 1	Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches,	3
UNIT 2	Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion	2
UNIT 3	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 DisasterManagement, 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: AGRONOMY

DURATION: 4 SEMESTERS (2 Years)

Course Structure of M.Sc. (Ag.) AGRONOMY

III SEMESTER

Course Details				Theory Assessment		Internal Assessment				Credit Distribution			Credits
Course Code	Course Type	Course Title	Total Marks	Major		Sessional		Practical		L	T	P	
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
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.) AGRONOMY

IV SEMESTER

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

SCHOOL OF AGRICULTURE

Semester – III

Course Title	Subject Code	Credits
Technical Writing and Communications Skills	MPGS20S505	1(0+1)
Intellectual Property and its Management in Agriculture	MPGS20S506	1(1+0)
Master's Research	MARE20S501	10(0+10)

SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			2nd Year, IIIrd Semester	
Department			Agronomy	
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.

Class			M.Sc. (Agriculture)	
Year/Semester			2nd Year, IIIrd Semester	
Department			Agronomy	
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 Avam Sanchalanal Adhyadesh, 2019)

SCHOOL OF AGRICULTURE

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

Semester – IV

Course Title	Subject Code	Credits
Master's Research	MARE20S501	10(0+10)

Class			M.Sc. (Agriculture)	
Year/Semester			2nd Year, IVth Semester	
Department			Agronomy	
Paper Name			Master's Research	
Subject Code			MARE20S501	
L	T	P	Credit Total	10(0+10)
0	0	10		

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
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			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.

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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.

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

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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 Avam Sanchalan) 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		