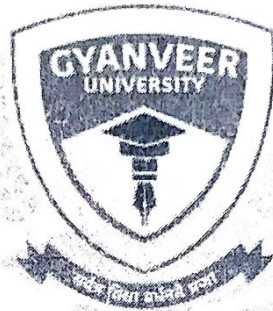


**Academic Year: 2023-2024**

**M. Sc. (Ag) Agronomy**



**Syllabus & Scheme**

**Semester – I & II**

**School of Agricultural Science**





**GYANVEER UNIVERSITY, SAGAR (M.P.)**  
**Scheme of Examination M.Sc (Agriculture-Agronomy) I Semester**  
*School of Agricultural Science (Academic Session 2023-24)*  
**Subject wise distribution of marks and corresponding credits**

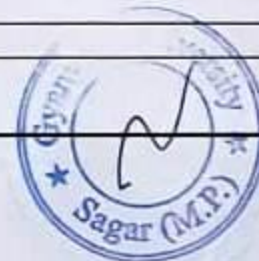
S. No.	Subject Type	Course	Subject Code	Paper Name	Maximum Marks Allotted										Total Marks	Contact Periods Per week			Credits Allotments	Total Credits
					Theory Slot					Practical Slot						L	T	P		
					End Term Exam	Internal Assessment Class test (Descriptive & Objective)/Assignment/Seminar			Internal Assessment			External Assessment								
						Final Exam	Internal Assessment I	Internal Assessment II	Internal Assessment III	Class test/Interaction	Attendance	Practical/Presentation/Lab Record	Viva Voce	Lab Work						
1	Major Course	M.Sc (Agriculture-Agronomy)	GUAGRO 101T	Modern concept in crop production(Theory)	70	15	15	15	-	-	-	-	-	100	2	0	0	2(2+0)	2	
3	Major Course		GUAGRO 102T	Principles and practices of water management (Theory)	70	15	15	15	-	-	-	-	-	100	2	0	0	3(2-1)	2	
4	Major Course		GUAGRO 102P	Principles and practices of water management (Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
5	Major Course		GUAGRO 103T	Agronomy of major cereals, pulses and Fodder Crop (Theory)	70	15	15	15	-	-	-	-	-	100	2	0	2	3(2-1)	2	
6	Major Course		GUAGRO 103P	Agronomy of major cereals, pulses and Fodder Crop (Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
7	Major Course		GUAGRO 104T	Cropping system and sustainable agriculture(Theory)	70	15	15	15	-	-	-	-	-	100	1	0	0	1(1+0)	1	
9	Major Course		GUAGRO 105T	Dry land farming and watershed management(Theory)	70	15	15	15	-	-	-	-	-	100	2	0	0	3(2-1)	2	
10	Major Course		GUAGRO 105P	Dry land farming and watershed management(Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
11	Minor Course		GUAGRO 106T	Statistical methods in applied Science(Theory)	70	15	15	15	-	-	-	-	-	100	3	0	0	4(2-1)	3	
12	Minor Course		GUAGRO 106P	Statistical methods in applied Science(Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
13	Supporting Course		GUAGRO 107T	Soil, water and air pollution(Theory)	70	15	15	15	-	-	-	-	-	100	1	0	0	2(1-1)	1	
14	Supporting Course		GUAGRO 107P	Soil, water and air pollution(Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
15	Non Credit Course		GUAGRO 108	Technical Writing and communication skill	NO CREDIT															
16	Non Credit Course		GUAGRO 109	Intellectual Property and Its management in Agriculture	NO CREDIT															

**Total of Credits = 18**

Note\* Allotment of Marks for Internal Assessment for theory portion is Best of Two / either of two and addition of them

\*R: Remedial course;

\*\* NC - Non Gradual Course





**Course Title : GUAGRO 101T- MODERN CONCEPT IN CROP PRODUCTION(Theory)**  
2(2+0)

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

**Theory**

**UNIT I-**

Crop growth analysis in relation to environment; agro-ecological zones of India.

**UNIT II-**

Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.

**UNIT III-**

Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield.

**UNIT IV-**

Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress.

**UNIT V-**

Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture.

**Suggested Readings**

1. Balasubramaniyan P & Palaniappan SP. 2001. Principles and Practices of Agronomy. Agrobios.
2. Reddy SR. 2000. Principles of Crop Production. Kalyani Publ.
3. Sankaran S & Mudaliar TVS. 1997. Principles of Agronomy. The Bangalore Printing & Publ.
4. Singh SS. 2006. Principles and Practices of Agronomy. Kalyani.



**Course Title : GUAGRO 102T - PRINCIPLES AND PRACTICES OF WATER  
MANAGEMENT(Theory)**

3 (2+1)

**Objective :** To teach the principles of water management and practices to enhance the water productivity.

**Theory**

**UNIT I –**

Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.

**UNIT II-**

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.

**UNIT III-**

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.

**UNIT IV-**

Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency.

**UNIT V-**

Excess of soil water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing.

**Course Title : GUAGRO 102P - PRINCIPLES AND PRACTICES OF WATER  
MANAGEMENT(Practical)**

**Practical**

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

**Suggested Readings**

1. Lenka D. 1999. Irrigation and Drainage. Kalyani
2. Michael AM. 1978. Irrigation: Theory and Practice. Vikas Publ.
3. Paliwal KV. 1972. Irrigation with Saline Water. IARI Monograph, New Delhi.
4. Panda SC. 2003. Principles and Practices of Water Management. Agrobios.
5. Prihar SS & Sandhu BS. 1987. Irrigation of Food Crops - Principles and Practices. ICAR.
6. Reddy SR. 2000. Principles of Crop Production. Kalyani.
7. Singh Pratap & Maliwal PL. 2005. Technologies for Food Security and Sustainable Agriculture. Agrotech Publ.





**Course Title: GUAGRO- 103T AGRONOMY OF MAJOR CEREALS, PULSES AND FODDER CROPS(Theory)** 3(2+1)

**Objective:** To teach the crop husbandry of cereals, pulse and fodder crops.

**Theory:**

#### UNIT-I

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of Wheat, barley, oat, rice, maize, sorghum, bajra.

#### UNIT-II

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of chickpea, field pea, lentil, rajmash, arhar, urd, moong, cowpea, soybean .

#### UNIT -III

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

#### UNIT- IV

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasses, napier grass, guinea grass, nandi grass, dinanath grass etc.

#### UNIT- V

Principles and methods of hay and silage making; chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage;



**Course Title: GUAGRO- 103P AGRONOMY OF MAJOR CEREALS, PULSES AND FODDER CROPS(Practical)**

**Practical**

1. Estimation of crop yield on the basis of yield attributes
2. Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
3. Working out growth indices (CER, CGR, RGR,NAR,
4. LAD Planning and layout of field experiments
5. Judging of physiological maturity indifferent crops
6. Intercultural operations in different crops.
7. Determination of cost of cultivation of different crops
8. Working out harvest index of various crops
9. Visit of field experiments on cultural, fertilizer, weed control and water management aspects Visit to nearby villages for identification of constraints in crop production

**Suggested Readings**

1. Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.
2. Hunsigi G & Krishna KR. 1998. *Science of Field Crop Production*. Oxford & IBH.
3. Jeswani LM & Baldev B. 1997. *Advances in Pulse Production Technology*. ICAR. Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.
4. Singh, SS. 1998. *Crop Management*. Kalyani.

**Course Title : GUAGRO 104T- CROPPING SYSTEMS AND SUSTAINABLE  
AGRICULTURE (Theory)**

1(1+0)

**Objective:** To acquaint the students about prevailing cropping systems in the country and practices to improve their productivity.

**Theory**

**UNIT I-**

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

**UNIT II-**

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

**UNIT III-**

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

**UNIT IV-**

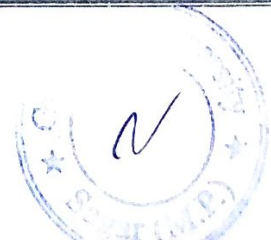
Crop diversification for sustainability; role of organic matter in maintenance of soil fertility; crop residue management; fertilizer use efficiency and concept of fertilizer use in intensive cropping system.

**UNIT V-**

Plant ideotypes for drylands; plant growth regulators and their role in sustainability.

**Suggested Readings**

1. Palaniappan SP & Sivaraman K. 1996. Cropping Systems in the Tropics; Panda SC. 2003. Cropping and Farming Systems. Agrobios.
2. Reddy SR. 2000. Principles of Crop Production. Kalyani.
3. Sankaran S & Mudaliar TVS. 1997. Principles of Agronomy. The Bangalore Printing & Publ. Co.
4. Singh SS. 2006. Principles and Practices of Agronomy. Kalyani.





**Course Title : GUAGRO 105T – DRY LAND FARMING AND WATERSHED MANAGEMENT  
(Theory)**

3 (2+1)

**Objective :** To teach the basic concepts and practices of dry land farming and soil moisture conservation.

**Theory**

**UNIT I-**

Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture.

**UNIT II-**

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.

**UNIT III-**

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.

**UNIT IV-**

Tillage, tith, 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.

**UNIT V-**

Concept of watershed resource management, problems, approach and components.





**Course Title : GUAGRO 105P – DRY LAND FARMING AND WATERSHED MANAGEMENT  
(Practical)**

**Practical**

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

**Suggested Readings**

1. Das NR. 2007. Tillage and Crop Production. Scientific Publishers. Dhopte AM. 2002. Agrotechnology for Dryland Farming. Scientific Publ.
2. Dhruv Narayan VV. 2002. Soil and Water Conservation Research in India. ICAR. Gupta US. (Ed.). 1995. Production and Improvements of Crops for Drylands. Oxford & IBH.
3. Katyal JC & Farrington J. 1995. Research for Rainfed Farming. CRIDA. 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.
5. Singh RP. 1988. Improved Agronomic Practices for Dry land Crops. CRIDA. Singh RP. 2005. Sustainable Development of Dry land Agriculture in India. Scientific Publ.
6. Singh SD. 1998. Arid Land Irrigation and Ecological Management. Scientific Publishers.
7. Venkateshwarlu J. 2004. Rainfed Agriculture in India. Research and Development Scenario. ICAR.



**Course Title : GUAGRO – 106T- STATISTICAL METHODS IN APPLIED SCIENCES (Theory) 4(3+1)**

**Objective** It would also help them in understanding the concepts involved in data presentation, analysis and interpretation. The students would get an exposure to presentation of data, probability distributions, parameter estimation, tests of significance, regression and multivariate analytical techniques.

**Theory**

**UNIT-I**

Classification, tabulation and graphical, representation of data. Box-plot, Descriptive statistics. Exploratory data analysis;

**UNIT -II**

Measures of central tendency- Mean, Median, Mode, Geometric mean, Harmonic mean.

**UNIT -III**

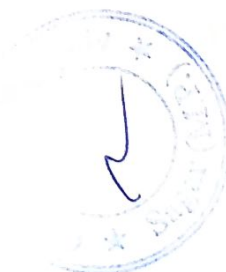
Measures of Dispersion- Range, Quartile deviation, Mean deviation, Standard deviation.

**UNIT -IV**

Theory of probability. Random variable and mathematical expectation. Discrete and continuous probability distributions. Correlation and regression

**UNIT- V**

Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution: chi-square, t and Fdistributions. Tests of significance based on Normal, chi-square, t and F distributions.





**Course Title : GUAGRO – 106P- STATISTICAL METHODS IN APPLIED SCIENCES (Practical)**

**Practical**

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

**Suggested Readings**

1. Anderson TW. 1958. An Introduction to Multivariate Statistical Analysis. John Wiley.
2. Goon AM, Gupta MK & Dasgupta B. 1977. An Outline of Statistical Theory. Vol. I
3. Goon AM, Gupta MK & Dasgupta B. 1983. Fundamentals of Statistics. Vol. I.
4. Hoel PG. 1971. Introduction to Mathematical Statistics. John Wiley.



**Course Title: GUAGRO- 107T- SOIL, WATER AND AIR POLLUTION(Theory) 2 (1+1)**

**Objective**

To make the students aware of the problems of soil, water and air pollution associated with use of soils for crop production.

**Theory**

**UNIT- I**

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

**UNIT- II**

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

**UNIT- III**

Sewage and industrial effluents—their composition and effect on soil properties / health, and plant growth and human beings; soil as sink for waste disposal.

**UNIT -IV**

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.

**UNIT -V**

Pollution of water resources due to leaching of nutrients and pesticides from soil; emission of greenhouse gases—carbon dioxide, methane and nitrous oxide. Remediation / amelioration of contaminated soil and water; remote sensing applications in monitoring and management of soil and water pollution.





**Course Title: GUAGRO- 107P- SOIL, WATER AND AIR POLLUTION (Practical)**  
**Practical**

1. 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
2. Heavy metals in contaminated soils and plants
3. Management of contaminants in soil and plants to safeguard food safety Air sampling and determination of particulate matter and oxides of sulphur
4. Visit to various industrial sites to study the impact of pollutants on soil and plants

**Suggested Readings**

1. Lal R, Kimble J, Levine E & Stewart BA. 1995. Soil Management and Greenhouse Effect. CRC Press.
2. Middlebrooks EJ. 1979. Industrial Pollution Control. Vol. I. Agro- Industries. John Wiley Interscience.
3. Ross SM. Toxic Metals in Soil Plant Systems. John Wiley & Sons.
4. Vesilund PA & Pierce 1983. Environmental Pollution and Control. Ann Arbor Science Publ.
5. Dhruv Narayan VV. 2002. Soil and Water Conservation Research in India. ICAR.
6. Gupta US. (Ed.). 1995. Production and Improvements of Crops for Drylands. Oxford & IBH. Katyal JC & Farrington J. 1995. Research for Rainfed Farming. CRIDA.
7. Rao SC & Ryan J. 2007. Challenges and Strategies of Dryland Agriculture. Scientific Publishers.
8. Singh P & Maliwal PL. 2005. Technologies for Food Security and Sustainable Agriculture. Agrotech Publishing Company.
9. Singh RP. 1988. Improved Agronomic Practices for Dryland Crops. CRIDA.
10. Singh RP. 2005. Sustainable Development of Dryland Agriculture in India. Scientific Publ.
11. Singh SD. 1998. Arid Land Irrigation and Ecological Management. Scientific Publishers.
12. Venkateshwarlu J. 2004. Rainfed Agriculture in India. Research and Development Scenario. ICAR.



**Course Title: GUAGRO 108:- Technical Writing and Communication Skill**

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

**Practical**

**Technical Writing** Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.

**Communication Skills** - Grammar (Tenses, parts of speech, clauses, punctuation marks); Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech:

Participation in group discussion: Facing an interview; presentation of scientific papers.

**Suggested Readings**

1. English Dictionary. 1995. Harper Collins. Gordon HM & Walter JA. 1970.
2. Technical Writing. 3rd Ed. Holt, Rinehart & Winston. Hornby AS. 2000. Comp.
3. James HS. 1994. Handbook for Technical Writing. NTC
4. Mohan K. 2005. Speaking English Effectively.
5. High School English Grammar and Composition. S. Chand & Co.





**Course Title : GUAGRO 109 – Intellectual Property and Its Management in Agriculture**

**Objective**

The main objective of this course is to equip students and stakeholders with knowledge of intellectual property rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledgebased economy.

**Theory**

**UNIT- I**

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs

**UNIT- II**

Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout

**UNIT -III**

Trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection

**UNIT -IV**

Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives

**UNIT- V**

Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.



**Suggested Readings**

1. Erbisch FH & Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill.
3. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC & Aesthetic Technologies. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V.
4. Technology Generation and IPR Issues. Academic Foundation. Rothschild M & Scott N. (Ed.). 2003.
5. Intellectual Property Rights in Animal Breeding and Genetics. CABI.
6. Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.
7. The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003.

