



# **Evaluation Scheme & Syllabus**

## **of**

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

**Course Curriculum**

*(w.e.f. Academic Session 2022-2023)*

**Department of Agriculture**

**INVERTIS UNIVERSITY- INVERTIS VILLAGE**

**Bareilly- Lucknow NH-24, Bareilly**

## Examination Scheme (Second Semester)

II Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1	MAGR-201	Agronomy of major Cereals and Pulses	2(2+0)
2	MAGR-202	Principles and Practices of Organic Farming	3(2+1)
3	MAGR-203	Basic Sampling Techniques	3(2+1)
4	MAGR-204	Soil Fertility and Plant nutrition	3(2+1)
5	MAGR-205	Agricultural Research, Research Ethics and Rural Development Programmers'	1(1+0)*
6	MAGR-206	Intellectual Property and its Management in Agriculture	1(1+0)*
7	MAGR-460	Master's Research	6(0+6)*
		<b>Total Credit</b>	<b>19 ((8+2*)+3+6*)</b>
*-Non gradial, ((8+2*)+3+6*)-:10 lectures,(8 Main course+2 Non gradial course) 9 practical's (3Main practicals+6 Non gradial practical's)			

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	MP
MAGR-201	Agronomy of major Cereals and Pulses	2	2	0	20	30	50	100	10.0
MAGR-202	Principles and Practices of Organic Farming	3	2	1	20	30	50	100	10.0
MAGR-203	Basic Sampling Techniques	3	2	1	20	30	50	100	10.0
MAGR-204	Soil Fertility and Plant Nutrition	3	2	1	20	30	50	100	10.0
MAGR-205	Agricultural Research, Research Ethics and Rural Development Programmes*	1	1	0	-	50	50	100	S
MAGR-206	Intellectual Property and its Management in Agriculture*	1	1	0	-	50	50	100	S
MAGR-460	Masters' Research*	6	0	6	-	-	-	-	S
C-Credit, L-Lecture, P-Practical, UT-Unit test, ESM: End semester marks, MP: Maximum Points, S: Satisfactory									

<b>MAGR - 201: AGRONOMY OF MAJOR CEREALS AND PULSES</b>	
<b>Teaching Scheme</b> Lectures and Practical: 2 hr./ week (2+0) Tutorials: Nil Credits: 2	<b>Examination Scheme</b> Unit test:50 End Semester Exam: 50 Marks

**Course objective:**

1. To teach the crop husbandry of cereals and pulse 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 crops *Rabi* cereals: Wheat, Barley and Oat

**UNIT II**

*Kharif* cereals: Rice, Maize, Sorghum, Pearl millet and Minor millet

**UNIT III**

*Rabi* pulses: Chickpea, pea, Lentil and Rajmash

**UNIT IV**

*Kharif* pulses: Arhar, Green gram, Black gram and Cowpea

**UNIT V**

*Zaid* crops: Urd and Moong

**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.
4. Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.

5. Kumar Ranjeet & Singh NP. 2003. *Maize Production in India: Golden Grain in Transition*.
6. Pal M, Deka J & Rai RK. 1996. *Fundamentals of Cereal Crop Production*. Tata McGraw Hill.
7. Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.  
Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.
8. Singh SS. 1998. *Crop Management*. Kalyani. Yadav DS. 1992. *Pulse Crops*. Kalyani.

**Course outcome:**

After completing the course student will be able to acquire Basic knowledge on cereals and pulse growing in the country.

<b>MAGR- 202: PRINCIPLES AND PRACTICES OF ORGANIC FARMING</b>	
<b>Teaching Scheme</b> Lectures and Practical: 3 hr./ week (2+1) Tutorials: Nil Credits: 3	<b>Examination Scheme</b> Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

**Course objective:**

- 1.To study the principles and practices of organic farming for sustainable crop production.

**Theory:****UNIT I**

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.

**UNIT II-**

Organic farming and water use efficiency; soil fertility, nutrient recycling , organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures and biofertilizers.

**UNIT III**

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

**UNIT IV**

Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides.

**UNIT V**

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

**Practical:**

- 1.Aerobic and anaerobic methods of making compost.
- 2.Making of vermicompost
- 3.Identification and nursery raising of important agro-forestry trees and trees for shelterbelts
- 4.Efficient use of biofertilizers, technique of treating legume seeds with *Rhizobium* cultures, use of *Azotobacter*, *Azospirillum*, and PSB cultures in field
- 5.Visit to an organic farm.

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

**Suggested Readings:**

1. Ananthakrishnan TN. (Ed.). 1992. *Emerging Trends in Biological Control of Phytophagous Insects*. Oxford & IBH.
2. Gaur AC. 1982. *A Manual of Rural Composting*, FAO/UNDP Regional Project Document, FAO.
3. Lampin N. 1990. *Organic Farming*. Press Books, Ipswich, UK. Palaniappan SP & Anandurai K. 1999. *Organic Farming – Theory and Practice*. Scientific Publ.
4. Rao BV Venkata. 1995. *Small Farmer Focused Integrated Rural Development: Socio-economic Environment and Legal Perspective: Publ.3, Parisaraprajna Parishtana, Bangalore.*
5. Reddy MV. (Ed.). 1995. *Soil Organisms and Litter Decomposition in the Tropics*. Oxford & IBH.
6. Sharma A. 2002. *Hand Book of Organic Farming*. Agrobios.
7. Singh SP. (Ed.) 1994. *Technology for Production of Natural Enemies*. PDBC, Bangalore.
8. Subba Rao NS. 2002. *Soil Microbiology*. Oxford & IBH.
9. Trivedi RN. 1993. *A Text Book of Environmental Sciences*, Anmol Publ.

**Course outcome:**

After completing the course student will be able to acquire Basic knowledge on organic farming for sustainable agriculture and development

<b>MAGR -203: BASIC SAMPALING TECHNIQUES</b>	
<b>Teaching Scheme</b> Lectures and Practical: 3 hr./ week (2+1) Tutorials: Nil Credits: 3	<b>Examination Scheme</b> Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

**Course objective:**

This course is meant for students of agricultural and animal sciences other than Statistics. The students would be exposed to elementary sampling techniques. It would help them in understanding the concepts involved in planning and designing their surveys, presentation of survey data analysis of survey data and presentation of results. This course would be especially important to the students of social sciences.

**Theory:****UNIT I**

Concept of sampling, sample survey vs complete enumeration, planning of sample survey, sampling from a finite population.

**UNIT II**

Simple random sampling with and without replacement, sampling for proportion, determination of sample size, inverse sampling, Stratified sampling.

**UNIT III**

Cluster sampling, Multi-stage sampling, systematic sampling; Introduction to PPS sampling,

**UNIT IV**

Use of auxiliary information at estimation, Ratio product and regression estimators. Double Sampling, sampling and non-sampling error

**Practical:**

1. Random sampling ~ use of random number tables, concepts of unbiasedness, variance, etc.
2. Simple random sampling, determination of sample size, inverse sampling, stratified sampling, cluster sampling and systematic sampling.
3. Estimation using ratio and regression estimators.
4. Estimation using multistage design, double sampling.

**Suggested Reading:**

1. Cochran WG. 1977. *Sampling Techniques*. John Wiley.
2. Murthy MN. 1977. *Sampling Theory and Methods*. 2<sup>nd</sup> Ed. Statistical Publ. Soc., Calcutta.
3. Singh D, Singh P and Kumar P. 1982. *Handbook on Sampling*

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*Methods.* IASRI Publ.

4. Sukhatme PV, Sukhatme BV, Sukhatme S and Asok C. 1984. *Sampling Theory of Surveys with Applications*. Iowa State University Press and Indian Society of Agricultural Statistics, New Delhi.
5. Cochran WG. 2007. *Sampling Techniques*, 3<sup>rd</sup> Edition. John Wiley & Sons Publication



<b>MAGR -204: SOIL FERTILITY AND PLANT NUTRITION</b>	
<b>Teaching Scheme</b> Lectures and Practical: 3 hr./ week (2+1) Tutorials: Nil Credits: 3	<b>Examination Scheme</b> Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

**Course objective:**

1.To teach basics of soil fertility evaluation, techniques of soil fertility evaluation, plant nutrients, integrated approach of plant nutrition, and environmental quality.

**UNIT II**

Soil fertility concept. Factor effecting of soil fertility. Essential and beneficial elements.

**UNIT II**

Nutrient deficiencies and toxicities-recent diagnostic techniques and ameliorative measures.

**UNIT III**

Nutrient and nutrient water interaction. Balanced use of nutrients. Integrated plant nutrient supply and management.

**UNIT IV**

Nutrient Uptake mechanisms, nutrient release and carry-over effects, quantity-intensity relationship.

**UNIT V**

Soil fertility evaluation, soil test crop response correlations.

**Practical:**

1. Laboratory and greenhouse experiments for evaluation of indices of nutrient availability and their critical value in soil and plant.
2. Determination of different pools of macro and micro nutrients. Quantity-intensity relation of P and Decomposition of organic matter in Soil enzymes
3. Measurement of important soil microbial processes such as ammonification, nitrification, N<sub>2</sub> fixation, S oxidation, P solubilization and mineralization of other micro nutrients Study of rhizosphere effect

**Suggested Readings:**

1. Alexander M. 1977. *Introduction to Soil Microbiology*. John Wiley & Sons.
2. Burges A & Raw F. 1967. *Soil Biology*. Academic Press.
3. McLaren AD & Peterson GH. 1967. *Soil Biochemistry*. Vol. XI. Marcel Dekker.
4. Metting FB. 1993. *Soil Microbial Ecology – Applications in Agricultural and Environmental Management*. Marcel Dekker.
5. Paul EA & Ladd JN. 1981. *Soil Biochemistry*. Marcel Dekker.
6. Reddy MV. (Ed.). *Soil Organisms and Litter in the Tropics*. Oxford & IBH.

**Course outcome:**

After completing the course student will be able to acquire Soil fertility concept. Factor effecting of soil fertility. And knowledge Essential and beneficial elements.

<b>MAGR-205: AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES</b>	
<b>Teaching Scheme</b> Lectures and Practical: 1 hr./ week (1+0) Tutorials: Nil Credits: 1	<b>Examination Scheme</b> Unit test:50 End Semester Exam: 50 Marks

**Course objective:**

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programs and policies of Government.

**Theory:****UNIT I**

History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility.

**UNIT II**

Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

**UNIT III**

Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

**Suggested Readings:**

1. Bhalla GS & Singh G. 2001. *Indian Agriculture - Four Decades of Development*

**Course outcome:** after completing the course student will be able to understand the functioning of research system in India and abroad, they will also be able to follow research ethics and have knowledge about various rural development programs and policies of govt.

<b>MAGR-206: INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE</b>	
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**Teaching Scheme**

Lectures and Practical: 1 hr./ week (1+0)

Tutorials: Nil

Credits: 1

**Examination Scheme**

Theory marks: 50Marks

End Semester Exam:50Marks

**Course objective:**

The main objective of this course is to equip students 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 knowledge-based economy.

**Theory:****UNIT I**

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement;

**UNIT II**

Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties;

**UNIT III**

Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and bio-diversity 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;

**UNIT VI**

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.93.
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. Technology Generation and IPR Issues*. Academic Foundation.
4. Rothschild M & Scott N. (Ed.). 2003. *Intellectual Property Rights in Animal Breeding and Genetics*. CABI.
  
5. Saha R. (Ed.). 2006. *Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies*. Daya Publ. House. *The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000;*
6. *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.*

**Course outcome:** after completing the course student will be able to have understanding of intellectual property rights, their importance and protection methods, Students will also be able to use IPR as a tool for value and wealth creation

