



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

Program Outcomes of M.Sc. (Agriculture) Agronomy

- ❖ **Soil management:** In this program student learn about soil mineralogy, genesis, classification, survey as well as management of problematic soils. It also deals with soil fertility and nutrient management practices.
- ❖ **Organic farming:** It provides a wide knowledge about different kind of organic manures and their efficient utilization in various cropping systems.
- ❖ **Weed management:** It enables the students to attain knowledge on basic principles and modern practices of weed management
- ❖ **Water management:** To teach the students about principles of water management of the crops and cropping systems, practices to enhance the water use efficiency
- ❖ **Crop management system:** Students learn about different cropping (oil seeds, fibers, legumes, cereals etc.) as well as farming system (IFS, organic farming, conservation farming etc.) and their modern concepts and principles. In this program students also learn about different kinds of crop production practices, their management as well as their interaction with allied sectors of agriculture. Student can work in Government Sector specially in Agriculture Department and different private sectors viz, pesticide companies, fertilizer companies, seed also in seed production sectors.

Examination Scheme (First Semester)

I Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1.	MAGR-101	Modern Concepts in Crop Production	3 (3+0)
2.	MAGR -102	Principles and Practices of Soil Fertility and Nutrient Management	3(2+1)
3.	MAGR -103	Principles and Practices of Weed Management	3(2+1)
4.	MAGR-104	Principles and Practices of Water Management	3(2+1)
5.	MAGR-105	Experimental Design	3(2+1)
6.	MAGR-106	Basic Concepts in Laboratory Techniques	1(0+1) *
7.	MAGR-107	Library and Information Services	1(0+1) *
8.	MAGR-460	Master's Research	3(0+3) *
Total Credit			20 (11+4+5*)
-Non gradial, (11+4+5)-:11 lectures, 9 practicals (4 Main practicals+ 5 Non gradial practicals)			

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	MP
MAGR-101	Modern Concepts in Crop Production	3	3	0	-	50	50	100	10.0
MAGR -102	Principles and Practices of Soil Fertility and Nutrient Management	3	2	1	20	30	50	100	10.0
MAGR -103	Principles and Practices of Weed Management	3	2	1	20	30	50	100	10.0
MAGR-104	Principles and Practices of Water Management	3	2	1	20	30	50	100	10.0
MAGR-105	Experimental Design	3	2	1	20	30	50	100	10.0
MAGR-106	Basic Concepts in Laboratory* Techniques	1	-	1	100			100	S
MAGR-107	Library and Information Services*	1	-	1	100			100	S
MAGR-460	Master's Research*	3	0	3	-	-	-	-	S
C-Credit, L-Lecture, P-Practical, PM-practical Marks UT-Unit test, ESM: End semester marks, MP: Maximum Points, S: Satisfactory									

MAGR- 101 MODERN CONCEPTS IN CROP PRODUCTION

Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (3+0) Tutorials: Nil Credits: 3	Unit Test: 50Marks End Semester Exam:50Marks

Course objective:

1. 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 and 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. Fageria NK. 1992. *Maximizing Crop Yields*. Marcel Dekker.
3. Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. *Soil Fertility and Fertilizers*. 7th Ed. Prentice Hall.
4. Paroda R.S. 2003. *Sustaining our Food Security*. Konark Publ. Reddy SR. 2000. *Principles of Crop Production*. Kalyani Publ.
5. Sankaran S & Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing &Publ.

Course outcome:

After completing the course student will be able to acquire Basic knowledge on soil management and crop production

MAGR-102: PRINCIPLE AND PRACTICES OF SOIL FERTILITY AND NUTRIENT MANAGEMENT	
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Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course objective:

1. To impart knowledge of fertilizers and manures as sources of plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of soil fertility.

Theory:**UNIT I**

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.

UNIT II

Criteria of essentiality of nutrients; Essential plant nutrients - their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients.

UNIT III

Preparation and use of farmyard manure, compost, green manures, vermin-compost, bio-fertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management.

UNIT IV

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.

UNIT V

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 vermin- compost and residue wastes in crops.

Practical:

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

Suggested Readings:

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*. 7th Ed. Prentice Hall.
4. Prasad R & Power JF. 1997. *Soil Fertility Management for Sustainable Agriculture*. CRC Press.
& BokdeS. 2000. *Manures and Fertilizers*. Agri-Horti Publ.

Course outcome:

After completing the course student will be able to acquire Basic knowledge on soil fertility and management

MAGR-103: PRINCIPLES AND PRACTICES OF WEED MANAGEMENT	
Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Teaching Scheme

Lectures and Practical: 3 hr./ week (2+1)

Tutorials: Nil

Credits: 3

Examination Scheme

Unit Test: 30Marks

Practical marks: 20Marks

End Semester Exam:50Marks

Course objective:

1. To familiarize the students about the weeds, herbicides and methods of weed control.

Theory:**UNIT I**

Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices.

UNIT II

Herbicide's introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides.

UNIT III

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 allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation.

UNIT IV

Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control.

UNIT V

Integrated weed management; cost: benefit analysis of weed management.

Practical:

1. Identification of important weeds of different crops
2. Preparation of a weed herbarium
3. Weed survey in crops and cropping systems
4. Crop-weed competition studies

5. Preparation of spray solutions of herbicides for high and low-volume sprayers
6. Use of various types of spray pumps and nozzles and calculation of swath width
7. Economics of weed control
8. Herbicide resistance analysis in plant and soil
9. Bioassay of herbicide resistance
10. Calculation of herbicidal requirement

Suggested Readings:

1. Aldrich RJ & Kramer RJ. 1997. *Principles in Weed Management*. Panima Publ. Ashton FM & Crafts AS. 1981. *Mode of Action of Herbicides*. 2nd Ed. Wiley Inter-Science.
2. Gupta OP. 2007. *Weed Management – Principles and Practices*. Agrobios. Mandal RC. 1990. *Weed, Weedicides and Weed Control - Principles and Practices*. Agro-Botanical Publ.
3. Rao VS. 2000. *Principles of Weed Science*. Oxford & IBH.
4. Subramanian S, Ali AM & Kumar RJ. 1997. *All About Weed Control*. Kalyani.
5. Zimdahl RL. 1999. *Fundamentals of Weed Science*. 2nd Ed. Academic Press.

Course outcome:

After completing the course student will be able to acquire basic knowledge on weed identification and control for crop production

MAGR-104: PRINCIPLES AND PRACTICES OF WATER MANAGEMENT	
Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course objective:

1. To teach the principles of water management and practices to enhance the water use efficiency.

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; micro irrigation system; fertigation; management of water in controlled environments and poly- houses.

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.

Practical:

1. Measurement of soil water potential by using tensiometer, and pressure plate and membrane apparatus
2. Soil-moisture characteristics curves
3. Water flow measurements using different devices
4. Determination of irrigation requirements
5. Calculation of irrigation efficiency
6. Determination of infiltration rate
7. 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.

Course outcome:

After completing the course student will be able to acquire Basic knowledge on water management for optimization of crop yield.

MAGR-105 EXPERIMENTAL DESIGN	
Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

This course is meant for students of agricultural and animal sciences other than Agricultural Statistics. Designing an experiment is an integrated component of research in almost all sciences. The students would be exposed to concepts of Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.

Theory:**UNIT I**

Need for designing of experiments, characteristics of a good design. Basic principles of designs-randomization, replication and local control.

UNIT II

Uniformity trials, size and shape of plots and blocks, Analysis of variance, Completely randomized design, randomized block design and Latin square design.

UNIT III

Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom. Concept of confounding.

UNIT IV

Split plot and strip plot designs, analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, Balanced Incomplete Block Design, resolvable designs and their applications, Lattice design, alpha design - concepts, randomization procedure, analysis and interpretation of results. Response surfaces. Combined

analysis.

Practical

1. Uniformity trial data analysis,
2. formation of plots and blocks,
3. Fairfield Smith Law,
4. Analysis of data obtained from CRD, RBD, LSD, Analysis of factorial experiments, Analysis with missing data, Split plot and strip plot designs.

Suggested Reading

1. Cochran WG and Cox GM. 1957. *Experimental Designs*. 2nd Ed. John Wiley.
2. Dean AM and Voss D. 1999. *Design and Analysis of Experiments*. Springer.
3. Montgomery DC. 2012. *Design and Analysis of Experiments*, 8th Ed. John Wiley.
4. Federer WT. 1985. *Experimental Designs*. MacMillan.
5. Fisher RA. 1953. *Design and Analysis of Experiments*. Oliver & Boyd.
6. Nigam AK and Gupta VK. 1979. *Handbook on Analysis of Agricultural Experiments*. IASRI Publ.
7. Pearce SC. 1983. *The Agricultural Field Experiment: A Statistical Examination of Theory*

and Practice. John Wiley.

Course outcome:

After completing the course student will be able to acquire and apply regression and other statistical methods to analyze field data and Gain proficiency in using statistical software for data analysis.

MAGR-106: BASIC CONCEPTS IN LABORATORY TECHNIQUES	
Teaching Scheme Lectures and Practical: 1 hr./ week (0+1) Tutorials: Nil Credits: 1	Examination Scheme Practical marks: 100 Marks

Course objective:

1. To acquaint the students about the basics of commonly used techniques in laboratory.

Practical:

1. Safety measures while in Lab;
2. Handling of chemical substances;
3. Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers micropipettes and vaccumets;
4. Washing, drying and sterilization of glassware;
5. Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution;
6. Handling techniques of solutions;
7. Preparation of different agro-chemical doses in field and pot applications;
8. Preparation of solutions of acids; Neutralization of acid and bases;
9. Preparation of buffers of different strengths and pH values.
10. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath;

11. Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability;

12. Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy

Suggested Readings:

1. Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press.
2. Gabb MH & Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co. Sage Publ.
3. Punia MS. *Manual on International Research and Research Ethics*. CCS, Haryana Agricultural University, Hisar.
4. Rao BSV. 2007. *Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives*. Mittal Publ.
5. Singh K. 1998. *Rural Development - Principles, Policies and Management*. Sage Publ.

Course outcome:

After completing the course, the student will be able to perform laboratory activities such as washing, drawing and sterilization of glass ware, drawing of solvents /chemicals and carry out experiments following best laboratory practices.

MAGR-107: LIBRARY AND INFORMATION SERVICES

Teaching Scheme	Examination Scheme
Lectures and Practical: 1 hr./ week (0+1) Tutorials: Nil Credits: 1	Practical marks: 100 Marks

Course objective:

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

Practical:

1. Introduction to library and its services;
2. Role of libraries in education, research and technology transfer;
3. 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.);
4. Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography;
5. Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services;
6. Use of Internet including search engines and its resources;

7. e-resources access methods.

Course outcome: after completing the course, student will be able to formulate search strategy and use modern tools for gathering desired information/data required, using best ethical practices.

