



Integral University, Lucknow
Integral Institute of Agricultural Science and Technology
Evaluation Scheme of Post Graduate Program
w.e.f. Session 2020-21

M. Sc. (Ag.) Agronomy

Semester-I

Course Code	Course Title	Type of Course	Periods/Per week			Evaluation Scheme Theory Mid Sem			Evaluation Scheme Practical Mid Sem			Practical End Sem Exam	Sub Total (Theory + Practical Mid Sem Exam)	End Sem Theory Exam	Subject Total	Credit	Total Credit Points	Attributes									
			L	T	P	CT	TA	Total	CT	TA	Total							Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics			
AA501	Modern Concept of Crop Production	Core courses (Compulsory)	3	0	0	20	10	30	-	-	-	0	0	70	100	3:0:0	3	√		√			√	√			
AA502	Principles and Practices of Weed Management		2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3	√		√		√	√	√			
Total																	06										
AA503	Organic Farming	Optional Courses	2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3	√		√		√	√	√			
Total																	09*										
*Major Course (Core course + Optional course) should not exceed more than 9 credit																											
MT519	Experimental Designs	Minor/ Related/ Supporting courses	2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3	√		√							
AS505	Soil Fertility and Nutrient Management		2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3	√	√	√		√					
AA505	Agronomy of Major Field Crop (Kharif)		3	0	0	20	10	30	-	-	-	0	0	70	100	3:0:0	3	√		√		√					
Total																	**										
PGS503 (e-Course)	Intellectual Property and Its Management in Agriculture	Non Credit Course (Compulsory)	1	0	0	20	10	30	-	-	-	0	0	70	100	1:0:0	1 [#]	√	√	√					√		
PGS504	Basic Concepts in Laboratory Techniques		0	0	2	0	0	0	-	25	25	75	25	-	100	0:0:1	1 [#]	√	√	√							
PGS507	e-Agriculture		1	0	2	20	10	30	-	-	-	20	50	50	100	1:0:1	2 [#]			√							
Grand Total																	***										

Grand Total (***) = *+**, credit should not exceed more than 18 credit in one semester; #Non-Gradiual Course

M.Sc. (Ag.) Agronomy
SEMESTER-I
Course Title: Modern Concept in Crop Production
Course Code: AA501
w.e.f. Session 2020-21

3(3+0)

Unit-I

Crop growth in relation to environment, agro ecological zones of India; concept of potential yield and its realization; modern concepts in tillage: zero or minimum, conservation tillage etc

Unit-II

Optimization of plant population and planting geometry in relation to soil fertility, solar radiation and available moisture regimes; Mitscherlich, Baule and Inverse- yield-nitrogen laws, biotic and abiotic stresses; concept of ideal plant type; crop modelling for maximizing crop yield; crop response production function

Unit-III

Cropping and farming systems for sustainable agriculture; organic farming crop. Residue recycling and management; crop production under protective agriculture, precision agriculture, precision agriculture; crop and growth analysis

Suggested Readings

1. Reena (2018) A Colour Handbook on Rainfed Kharif Crops: Protection, Constraints and Mitigation Strategies. New India Publishing Agency.
2. E. Somasundaram (2018) Agronomy: Principles and Practices. New India Publishing Agency.
3. Balasubramanian P & Palaniappan SP. 2001. Principles and Practices of Agronomy. Agrobios.
4. Fageria NK. Maximizing Crop Yields. Marcel Dekker.
5. Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. Soil Fertility and Fertilizers. 7th Ed Prentice Hall.
6. Paroda R.S. 2003. Sustaining our Food Security. Konark Publ.
7. Reddy SR. Revised 2016 Ed. Principles of Crop Production. Kalyani Publ.
8. Popular Agronomy Books from Goodreads.com <https://www.goodreads.com/shelf/show/agronomy>

M.Sc. (Ag.) Agronomy
SEMESTER-I
Course Title: Principles and Practices of Weed Management
Course Code: AA502
w.e.f. Session 2020-21

3(2+1)

Unit-I

Classification and characteristics of weeds; special weed problems including aquatic and parasitic weeds, ecology and physiology of major weed; eco-physiology of crop weed competition including allelopathy; weed indices; principles and method of weed control.

Unit-II

Concept of integrated weed management; weed control through bio-herbicides, myco-herbicides and allelo-chemicals; herbicides history, development and their classification; mode and mechanism of action of herbicides; herbicide selectivity, herbicide mixtures.

Unit-III

Adjuvant and safeners; degradation of herbicides in soil and plants; effect of herbicides in relation to environment; herbicide resistance in weeds and crops; weed management in major crops and cropping systems; weed shifts in cropping systems; control of weed in non-cropped situations.

Practical: Identification of important weeds of different crops; preparation of a weed 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.

Suggested Readings

1. Das P. C. (2015) Weed Science, New India Publishing Agency.
2. Aldrich RJ & Kramer RJ. 1997. Principles in Weed Management. Panima Publ.
3. Ashton FM & Crafts AS. 1981. Mode of Action of Herbicides. 2nd Ed. Wiley Inter-Science.
4. Gupta OP. 2007. Weed Management – Principles and Practices. Agrobios.
5. Mandal RC. 1990. Weed, Weedicides and Weed Control - Principles and Practices. Agro-Botanical Publ.
6. Rao VS. 2000. Principles of Weed Science. Oxford & IBH.
7. Subramanian S, Ali AM & Kumar RJ. 1997. All About Weed Control. Kalyani.

M.Sc. (Ag.) Agronomy
SEMESTER-I
Course Title: Organic Farming
Course Code: AA503
w.e.f. Session 2020-21

3(2+1)

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 ,water use efficiency.

Unit-II

Soil fertility-nutrient recycle, organic residues, organic manures, composition, soil biota and decomposition of organic residues, earthworms and vermin-compost, green manures , bio-fertilizers, farming systems crop rotations multiples and relay cropping systems, intercropping in relation to maintenance of soil productivity.

Unit-III

Control of weeds, diseases and insects pests; animals husbandry, dairy farming, sheep and goat and piggery etc. Integrated pest management biological agents and pheromones, bio-pesticides.

Unit-IV

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

Practical

Aerobic and anaerobic methods of making compost, making of vermin compost; Identification and nursery raising of important agro-forestry trees and trees for shelter belts, Efficient use of bio-fertilizers technique of treating legume seeds with *Rhizobium* cultures, use of *Azotobacter*, *Azospirillum* and PSB cultures in field; Visit to a organic farm; Quality standard, inspection, certification and labeling and accreditation procedures for farm produce from organic farms.

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. Khare D & Bhale MS. 2000. Seed Technology. Scientific Publ.
4. Kumar Ranjeet & Singh NP. 2003. Maize Production in India: Golden Grain in Transition. IARI, New Delhi.
5. Pal M, Deka J & Rai RK. 1996. Fundamentals of Cereal Crop Production. Tata McGraw Hill.
6. Prasad, Rajendra. 2002. Text Book of Field Crop Production. ICAR.
7. Reena (2018) A Colour Handbook on Rainfed Kharif Crops: Protection, Constraints and Mitigation Strategies. New India Publishing Agency.
8. E. Somasundaram (2018) Agronomy: Principles and Practices. New India Publishing Agency.

M. Sc. (Ag.)
SEMESTER-I
Course Title: Experimental Designs
Course Code: MT519
w.e.f. Session 2018-19

3(2+1)

Unit-I

Experiments: Absolute Experiments, Comparative experiments, need for designing of experiments, characteristics of a good design. Treatment, experimental unit, blocks, yield, uniformity trials, size and shape of plots and blocks. Principles of design of experiment: randomization, replication and local control.

Unit-II

Designs of experiments: Completely Randomized Design, Randomized Block Design and Latin square design and their analysis of variance. factorial design; symmetrical and asymmetrical. Confounding in symmetrical factorial experiments, factorial experiments with control treatment, advantages and disadvantages of confounding.

Unit-III

Analysis of covariance for two-way classification (Randomized Block Design). Split plot design: comparison between split-plot design and factorial design, advantages and disadvantages of split plot design. Missing Plot techniques: Analysis of missing plot design (Fisher's Rule), analysis of Randomized Block Design with one missing observation, analysis of Latin Square Design with one missing observation

Unit-IV

Balanced Incomplete Block Design (BIBD), parameters of BIBD, Incidence matrix, Symmetric BIBD, Analysis of BIBD, efficiency of BIBD relative to Randomized Block Design, Response Surfaces.

Practical

Uniformity trial data analysis, formation of plots and blocks, Analysis of data obtained from Completely Randomized Design, Randomized Block Design, Latin Square Design; Analysis of factorial experiments without and with confounding; Analysis with missing data; Split plot designs; Transformation of data; Fitting of response surfaces.

Suggested Readings:

1. Cochran, W.G. and Cox, G.M. Experimental Design. Asia Publishing House.
2. Kempthorne, O. (1965): The Design and Analysis of Experiments. John Wiley.
3. Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.
4. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics. Vol. II, 8thEdn. World Press, Kolkata.
5. Casella, G, (2008). Statistical Design. Springer.
6. Gupta, S.C. and Kapoor, V.K. Latest Revised Edition 2015. Fundamentals of Applied Statistics.

M. Sc. (Ag.)
SEMESTER-I
Course Title: Soil Fertility and Nutrient Management
Course Code: AS505
w.e.f. Session 2020-21

3(2+1)

Unit-I

Soil fertility and Soil productivity; nutrient sources fertilizers and manures; essential plant nutrients - functions and deficiency symptoms. Soil and fertilizer, nitrogen sources, forms, immobilization and mineralization, nitrification, denitrification; biological nitrogen fixation -types, mechanism, microorganisms and factors affecting; nitrogenous fertilizers and their fate in soils; management of fertilizer nitrogen in lowland and upland conditions for high fertilizer use efficiency.

Unit-II

Soil and fertilizer phosphorus - forms, immobilization, mineralization, reactions in acid and alkali soils; factors affecting phosphorus availability in soils; phosphatic fertilizers - behavior in soils and management under field conditions. Potassium - forms, equilibrium in soils and its agricultural significance; mechanism of potassium fixation; management of potassium fertilizers under field conditions. Sulphur - source, forms, fertilizers and their behavior in soils; calcium and magnesium– factors affecting their availability in soils; management of sulphur, calcium and magnesium fertilizers.

Unit-III

Micronutrients-critical limits in soils and plants; factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability. Common soil test methods for fertilizer recommendations; quantity intensity relationships; soil test crop response correlations and response functions.

Unit-IV

Fertilizer use efficiency; blanket fertilizer recommendations usefulness and limitations; site-specific nutrient management; plant need based nutrient management; integrated nutrient management. Soil fertility evaluation - biological methods, soil, plant and tissue tests; soil quality in relation to sustainable agriculture.

Practical: Principles of colorimetry, Flame-photometry and atomic absorption spectroscopy, Chemical analysis of soil for total and available nutrients, Analysis of plants for essential elements.

Suggested Readings:

- J.S. Kanwar et al., Soil Fertility Theory and Practice
- Womwe, P.L and Swift, M.J., Soil Management of Tropical Soil Fertility
- Mengel K and Kirkby, EA, Principles of Plant Nutrition
- ISSS, New Delhi, Fundamentals of Soil Science
- Jackson, M.L., Soil Chemical Analysis
- Dipak Sarkar and Abhijit Haldar., Fundamental Principles of Soil Science
- Henry DF Boyd GE 2nd ed., Soil Fertility
- Nyle C. Brady and Ray R Weil, Nature and Properties of Soils

**M.Sc. (Ag.) Agronomy
Semester-I**

Course Title: Agronomy of Major Field Crops (Kharif)

Course Code: AA505

w.e.f. Session 2019-20

3 (3+0)

Unit I

Origin, history, distribution, adaptation, classification, morphology, phenology, varietal improvement and production technology of Rice Maize, Sorghum, Pearl-millet

Unit II

Origin, history, distribution, adaptation, classification, morphology, phenology, varietal improvement and production technology of Smaller-millet, Pigeon pea, Mung bean, Urd bean, Cowpea, Moth bean, Groundnut, Sunflower, Sesame, Niger, Caster, Soybean, Cotton, Jute, Mesta & Sugarcane.

Unit III

Quality components and industrial uses of the main and by-products and their post harvest handling for marketing

Suggested Readings:

- Das NR. 2007. Introduction to Crops of India. Scientific Publ.
- Kumar Ranjeet & Singh NP. 2003. Maize Production in India: Golden Grain in Transition. IARI, New Delhi
- Khare D & Bhale MS. 2000. Seed Technology. Scientific Publ.
- Hunsigi G & Krishna KR. 1998. Science of Field Crop Production. Oxford & IBH.
- Pal M, Deka J & Rai RK. 1996. Fundamentals of Cereal Crop Production. Tata McGraw Hill.

**M. Sc. (Ag.)/MBA Agribusiness Management
SEMESTER-I**

Course Title: Intellectual Property and Its Management in Agriculture

Course Code: PGS503

w.e.f. Session 2018-19

1(1+0)

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, trade secrets and traditional knowledge, trademarks,

Unit-III

Protection of plant varieties and farmers' rights and bio-diversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture

Unit-IV

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. Download e-course free from: <http://hau.ac.in/HRM/pdf/ecourse503.pdf>
3. Chandan Roi (2018). The Role of Intellectual Property Rights in Agriculture and Allied Sciences CRC Press.
4. Neeraj Pandey and Kushdeep Dharni. Intellectual Property Rights PHI Learning Pvt. Limited.

M. Sc. (Ag.)/MBA Agribusiness Management
SEMESTER-I
Course Title: Basic Concepts in Laboratory Techniques
Course Code: PGS504
w.e.f. Session 2018-19

1(0+1)

Practical

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vascupets; 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; Neutralization 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, sandbath, waterbath, 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

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.

**M. Sc. (Ag.)/MBA Agribusiness Management
SEMESTER-I**

Course Title: e-Agriculture

Course Code: PGS507

w.e.f. Session 2018-19

2(1+1)

UNIT-I

Introduction and Applications of e-Agriculture, Introduction to Online Agricultural resources: Consortium for e-resources in Agriculture (CeRA), e-agriculture community, Agriculture: National Portal of India. Agricultural Datasets and Databases: Agricola, Agris. Need of Biological databases in Agricultural Sciences

UNIT-II

ICAR- Centre for Agricultural Bioinformatics (CABin): Mandates and Thrust areas; National Agricultural Bioinformatics Grid (NABG): ASHOKA - Advanced Supercomputing Hub for OMICS Knowledge in Agriculture: features and applications; National Bio-Computing Portal: objectives, facilities provided at NBCP.

UNIT-III

Education – Meaning, Definition, Types – Formal Informal and Non-formal education and their Characteristics. Individual contact methods – Meaning, Objectives, Steps. Group contact methods, Mass contact Methods and Innovative Information sources, Method of training.

UNIT-IV

Agricultural Journalism – Meaning, Scope and Importance, Sources of news, Types of training, RRA, PRA tools and techniques KVK, Adopter categories, MANAGE, EEI: extension education institute.

Practicals: Usage of Biological database and tools, Briefing about retrieval of scientific articles from PubMed database and NAL Online Catalog – AGRICOLA, PRA tools and techniques, Introduction of Geospatial Technology for generating valuable information for Agriculture, Research priorities at NABG, Softwares and Tools available at NABG, Link to available Database resources at NABG and its implications.

Suggested Readings:

1. Agri Informatics: An Introduction (Industry Series), by R Chakravarthy, ICFAI University Press
2. E-Agriculture: Concepts and Applications (Agriculture Series), Rahul Gupta (Author), ICFAI University Press
3. Introduction to Bioinformatics by Teresa Attwood, David Parry-Smith 1st edition; Prentice Hall Publications
4. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins by Andreas D. Baxeavanis and B. F. Francis Ouellette (Eds), 2nd Edition; Willey & Sons Publications.
5. Bioinformatics: Sequence, Structure, and Databanks: A Practical Approach by Des Higgins, Willie Taylor; OUP.
6. BIOS Instant Notes in Bioinformatics by Charlie Hodgman, Andrew French, David Westhead, Taylor & Francis publishing; 2 edition.