



Integral University, Lucknow
Integral Institute of Agricultural Science and Technology
Evaluation Scheme of Post Graduate Program
w.e.f. Session 2022-23

M. Sc. (Ag.) Agronomy

SEMESTER-II

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	
AGR0N 502	Principles and Practices of Soil Fertility and Nutrient Management	Major	2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3	√		√			√	√	
AGR0N 504	Principles and Practices of Water Management		2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3	√		√		√	√	√	
Total																	06								
AGR0N 509	Agronomy of Fodder and Forage Crops	Optional	2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3	√		√		√	√	√	
Total																	*								
*Major Course (Core course + Optional course) should not exceed more than 9 credit																									
SOIL 506	Soil Biology and Biochemistry	Minor	2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3			√		√	√	√	
		Supporting																							
Total																	**								
PGSS02	Technical Writing and Communications Skills	Common	0	0	2	0	0	-	-	-	-	25	75	0	100	0:0:1	1	√		√				√	
PGSS05 (e- Course)	Agricultural Research, Research Ethics and Rural Development Programmes		1	0	0	20	10	30	-	-	-	0	0	70	100	1:0:0	1	√		√			√	√	
AGR0N 550	Master's Seminar		-	-	-	-	-	-	-	-	-	-	-	-	100	0:0:1	1			√					
AGR0N 560	Master's Research		-	-	-	-	-	-	-	-	-	-	-	-	S/US	0:0:5	5 ^s	√		√			√	√	
Grand Total																	***								

Grand Total (***) = *+**, credit should not exceed more than 22 credit in one semester; ^sMaster's Research credit to be counted in Final Semester examinations;
S/US=Satisfactory/Unsatisfactory

M.Sc. (Ag.) Agronomy
SEMESTER-II
Course Title: Principles and Practices of Soil Fertility and Nutrient Management
Course Code: AGRON 502
w.e.f. Session 2022-23

3(2+1)

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, vermicompost, biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management. Soil less cultivation.

Unit-IV

Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures and grades; 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 nutrients; economics of fertilizer use; integrated nutrient management; use of vermincompost and residue wastes in crops.

Practical:

Determination of soil pH and soil EC; Determination of soil organic C; Determination of available N, P, K and S of soil; Determination of total N, P, K and S of soil; Determination of total N, P, K, S in plant; Computation of optimum and economic yield.

Suggested Readings:

- Brady NC and Weil RR. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
- Fageria NK, Baligar VC and Jones CA. 1991. Growth and Mineral Nutrition of Field Crops. Marcel Dekker.
- Havlin JL, Beaton JD, Tisdale SL and Nelson WL. 2006. Soil Fertility and Fertilizers. 7th Ed. Prentice Hall.
- Prasad R and Power JF. 1997. Soil Fertility Management for Sustainable Agriculture. CRC Press.
- Yawalkar KS, Agrawal JP and Bokde S. 2000. Manures and Fertilizers. Agri-Horti Publ.

COURSE OBJECTIVES:

- Knowledge and concept of soil fertility and productivity
- Knowledge of plant nutrients and their suitable sources
- Knowledge of fertilizers and manures
- Concepts of maximizing fertilizer use efficiency
- Study of efficient nutrient management
- Integrated nutrient management

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
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M.Sc. (Ag.) Agronomy
SEMESTER-II
Course Title: Principles and Practices of Water Management
Course Code: AGRON 504
w.e.f. Session 2022-23

3(2+1)

Unit-I

Water and its role in plants; Irrigation: Definition and objectives, water resources and irrigation development in of India and concerned state, major irrigation projects, extent of area and crops irrigated in India and in different states.

Unit-II

Field water cycle, 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. Water availability and its relationship with nutrient availability and losses.

Unit-III

Soil, plant and meteorological factors determining water needs of crops, scheduling, depth and methods of irrigation; micro irrigation systems; deficit irrigation; fertigation; management of water in controlled environments and polyhouses. Irrigation efficiency and water use efficiency.

Unit-IV

Water management of crop and cropping system, Quality of irrigation water and management of saline water for irrigation, water use efficiency, Crop water requirement- estimation of ET and effective rainfall; Water management of the major crops and cropping systems. Automated irrigation system.

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; rain water management and its utilization for crop production.

Unit-VI

Quality of irrigation water and management of saline water for irrigation, water management in problem soils. Soil moisture conservation, water harvesting, rain water management and its utilization for crop production. Hydroponics. Water management of crops under climate change scenario.

Practical:

Determination of Field capacity by field method; Determination of Permanent Wilting Point by sunflower pot culture technique; Determination of Field capacity and Permanent Wilting Point by Pressure Plate Apparatus; Determination of Hygroscopic Coefficient; Determination of maximum water holding capacity of soil; Measurement of matric potential using gauge and mercury type tensiometer; Determination of soil-moisture characteristics curves, Determination of saturated hydraulic conductivity by constant and falling head method; Determination of hydraulic conductivity of saturated soil below the water table by auger hole method; Measurement of soil water diffusivity; Estimation of unsaturated hydraulic conductivity; Estimation of upward flux of water using tensiometer and from depth ground water table; Determination of irrigation requirement of crops (calculations); Determination of effective rainfall (calculations); Determination of ET of crops by soil moisture depletion method; Determination of water requirements of crops; Measurement of irrigation water by volume and velocity-area method; Measurement of irrigation water by measuring devices and calculation of irrigation efficiency; Determination of infiltration rate by double ring infiltrometer.

Suggested Readings:

- Majumdar DK. 2014. Irrigation Water Management: Principles and Practice. PHL Learning Private Publishers
- Mukund Joshi. 2013. A Text Book of Irrigation and Water Management Hardcover, Kalyani Publishers
- Lenka D. 1999. Irrigation and Drainage. Kalyani.
- Michael AM. 1978. Irrigation: Theory and Practice. Vikas Publ.
- Paliwal KV. 1972. Irrigation with Saline Water. IARI Monograph, New Delhi.

	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	3	3	2	2	3	2	2	2	3	3	2	2
CO2	3	3	2	3	2	2	2	2	2	1	3	3	3	3	3
CO3	2	3	3	2	3	1	3	2	3	2	2	3	3	3	3
CO4	2	3	3	3	3	3	1	1	2	1	3	3	3	3	2
CO5	2	2	2	3	2	3	2	3	3	2	2	3	2	2	2
3: Strong contribution, 2: average contribution, 1: Low contribution															

M. Sc. (Ag.) Agronomy
SEMESTER-II
Course Title: Agronomy of Fodder and Forage Crops
Course Code: AGRON 509
w.e.f. Session 2022-23

3(2+1)

Unit-I

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important fodder crops like sorghum, maize, bajra, guar, cowpea, oats, barley, berseem, senji, lucerne, etc.

Unit-II

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasses like Napier grass, Panicum, Lasiurus, Cenchrus, etc.

Unit-III

Year-round fodder production and management, preservation and utilization of forage and pasture crops.

Unit-IV

Principles and methods of hay and silage making; chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage; use of physical and chemical enrichments and biological methods for improving nutrition; value addition of poor quality fodder. Fodder production through hydroponics. Azolla cultivation.

Unit-V

Economics of forage cultivation uses and seed production techniques of important fodder crops.

Practical:

Practical training of farm operations in raising fodder crops; Canopy measurement, yield, Leaf: Stem ratio and quality estimation, viz. crude protein, NDF, ADF, lignin, silica, cellulose and IVDMD, etc. of various fodder and forage crops; Anti-quality components like HCN in sorghum and such factors in other crops; Hay and silage making and economics of their preparation.

Suggested Readings:

- Chatterjee BN. 1989. Forage Crop Production - Principles and Practices. Oxford & IBH.
- Das NR. 2007. Introduction to Crops of India. Scientific Publ.
- Narayanan TR and Dababghao PM. 1972. Forage Crops of India. ICAR.
- Singh P and Srivastava AK. 1990. Forage Production Technology. IGFRI, Jhansi.
- Singh C, Singh P and Singh R. 2003. Modern Techniques of Raising Field Crops. Oxford & IBH.
- Tejwani KG. 1994. Agroforestry in India. Oxford & IBH.

COURSE OBJECTIVES:

- To impart knowledge of crop husbandry of fodder crops
- Package of practices for forage crop production
- Suitable cropping system involving fodder crops

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basic knowledge on fodder growing in the country
CO2	Production technology of forage & fodder crops
CO3	Best cropping system based on forage crops in crop rotation

CO-PO-PSO MAPPING

	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	2	2	3	2	2	2	3	3	3	2
CO2	3	3	2	3	2	2	2	1	2	1	3	2	3	3	3
CO3	2	3	3	2	2	2	3	2	3	2	2	3	3	2	2
3: Strong contribution, 2: average contribution, 1: Low contribution															

M. Sc. (Ag.) Soil Science
SEMESTER-II
Course Title: Soil Biology and Biochemistry
Course Code: SOIL 506
w.e.f. Session 2022-23

3(2+1)

Unit-I

Soil biota, soil microbial ecology, types of organisms in different soils; soil microbial biomass; microbial interactions; un-culturable soil biota.

Unit-II

Microbiology and biochemistry of root-soil interface; phyllosphere; soil enzymes, origin, activities and importance; soil characteristics influencing growth and activity of microflora; Root rhizosphere and PGPR.

Unit-III

Microbial transformations of nitrogen, phosphorus, sulphur, iron and manganese in soil; biochemical composition and biodegradation of soil organic matter and crop residues, microbiology and biochemistry of decomposition of carbonaceous and proteinaceous materials, cycles of important organic nutrients.

Unit-IV

Organic wastes and their use for production of biogas and manures; biotic factors in soil development; microbial toxins in the soil. Preparation and preservation of farmyard manure, animal manures, rural and urban composts and vermicompost. Biofertilizers—definition, classification, specifications, method of production and role in crop production; FCO specifications and quality control of biofertilizers.

Unit-V

Biological indicators of soil quality; bioremediation of contaminated soils; microbial transformations of heavy metals in soil; role of soil organisms in pedogenesis – important mechanisms and controlling factors; soil genomics and bioprospecting; soil sickness due to biological agents; xenobiotics; antibiotic production in soil.

Practical:

Determination of soil microbial population; Soil microbial biomass carbon; Elemental composition, fractionation of organic matter and functional groups; Decomposition of organic matter in soil; Soil enzymes; Measurement of important soil microbial processes such as ammonification, nitrification, N₂ fixation, S oxidation, P solubilization and mineralization of other micronutrients.

Suggested Readings:

- Paul EA and Clark FE. Soil Microbiology and Biochemistry.
- Lynch JM. Soil Biotechnology
- Willey JM, Linda M. Sherwood and Woolverton CJ. Prescott's Microbiology.
- Subba Rao NS. Advances in Agricultural Microbiology.

COURSE OBJECTIVES:

- To learn about the soil biology
- To provide knowledge various methods of enzymatic activities in soil
- To know the essential micro nutrients
- To learn about soil biochemistry
- To study about biofertilizers

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To learn about the soil biology

M. Sc. (Ag.)/M.Sc. (Hort.)/MBA Agribusiness Management
SEMESTER-II
Course Title: Technical Writing and Communications Skills
Course Code: PGS502
w.e.f. Session 2018-19

1(1+0)

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

- Wren PC & Martin H. 2006. High School English Grammar and Composition. S. Chand & Co.
- Robert C. (Ed.). 2005. Spoken English: Flourish Your Language. Abhishek.
- Mohan K. 2005. Speaking English Effectively. MacMillan India.
- Sethi J & Dhamija PV. 2004. Course in Phonetics and Spoken English. 2nd Ed. Prentice Hall of India.
- Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6th Ed. Oxford University Press.
- Joseph G. 2000. MLA Handbook for Writers of Research Papers. 5th Ed. Affiliated East-West Press.
- Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.
- Collins' Cobuild English Dictionary. 1995. Harper Collins.
- James HS. 1994. Handbook for Technical Writing. NTC Business Books.
- Gordon HM & Walter JA. 1970. Technical Writing. 3rd Ed. Holt, Rinehart & Winston.
- Richard WS. 1969. Technical Writing. Barnes & Noble.

COURSE OBJECTIVES:

- To give knowledge about the various forms of scientific writings
- To give knowledge about the various parts of thesis, research communications
- To give knowledge about writing of abstracts, summaries, citations etc
- To give knowledge about research communications, illustrations, photograph, drawings
- To give knowledge about pagination, scientific write ups, editing and proof reading, and writing of review article

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn that what are the various forms of scientific writings
CO2	Learn how to write the various parts of thesis, research communications
CO3	Learn how to do writing of abstracts, summaries and what are citations etc
CO4	Learn research communications, illustrations, photograph, drawings

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

Course Title: Agricultural Research, Research Ethics and Rural Development Programmes

Course Code: PGS505 (e-Course)

w.e.f. Session 2018-19

1(0+1)

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 Centers (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 Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

Suggested Readings:

- Bhalla GS & Singh G. 2001. Indian Agriculture - Four Decades of Development. Sage Publ.
- Punia MS. Manual on International Research and Research Ethics. CCS, Haryana Agricultural University, Hisar.
- Rao BSV. 2007. Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives. Mittal Publ.
- Singh K. 1998. Rural Development - Principles, Policies and Management. Sage Publ..

COURSE OBJECTIVES:

- To know the objective and principle of extension education
- To obtain idea on various development programmes in agriculture and allied area to help farmers.
- To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students capable, efficient, and self-reliant in character.
CO2	They gain knowledge to help rural families in better appreciation of SWOT in the village.
CO3	They know about to open new opportunities for developing talents and leadership of rural people.

