

M.Sc. Agriculture (Agronomy) First Year (1st and 2nd Semester) Session 2018-19, 2019-20

MATA GUJRI COLLEGE

FATEHGARH SAHIB

(AN AUTONOMOUS COLLEGE)

RE-ACCREDITED BY NAAC WITH “A” GRADE

“COLLEGE WITH POTENTIAL FOR EXCELLENCE” STATUS BY UGC



SYLLABI

SESSION: (2018-19, 2019-20)

FACULTY OF LIFE SCIENCE

DEPARTMENT OF AGRICULTURE

COURSE: MASTER OF SCIENCE AGRICULTURE

AGRONOMY

Outline of Major courses of Agronomy for Semester-I
M.Sc. Agriculture (Agronomy)
Semester-I

Paper Code	Subject	Credit hours		Marks		External Assessment		Internal Assessment		Grand Total
		Theory	Practical	Theory	Practical	Theory	Practical	Theory	Practical	
AGRON-501	MODERN CONCEPTS IN CROP PRODUCTION	3	0	100	00	60	00	40	00	100
AGRON-503	PRINCIPLES AND PRACTICES OF WEED MANAGEMENT	3	1	75	25	45	25	30	00	100
SOILS- 502	SOIL FERTILITY AND FERTILIZER	3	1	75	25	45	25	30	00	100
ENG-501	TECHNICAL WRITING AND COMMUNICATION SKILLS	3	0	100	00	60	00	40	00	100
STAT – 501	STATISTICAL METHODS	3	1	75	25	45	25	30	00	100
TOTAL		15	3	425	75	155	75	170	00	500

*One credit hour of Practical= 2 hours

*One credit hour of Theory= 1 hour

*One credit hour of Master Research= 1 hour

AGRONOMY
Course Contents

AGRON 501 MODERN CONCEPTS IN CROP PRODUCTION

Time: 3 Hours

Max. Marks: 100

Periods per Week: 3+0

Theory Internal assessment: 40

Theory external assessment: 60

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 12 marks each. Student will have to attempt two questions from each section. Section - C will consist of 12 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of section-C are compulsory.

Objective

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

Theory

UNIT I

1. Crop growth analysis in relation to environment; Agro-ecological and Agro-climatic zones of India.
2. Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.
3. Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources.
4. Concept of ideotype and ideotype of various crop; crop modeling for desired crop yield.

UNIT II

5. Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress.
6. Integrated farming systems, organic farming; concept, advantages, problem.
7. Resource conservation technology including basic concept, tools, advantage and problem; Dryland farming; determining the nutrient needs for yield potentiality of crop plants.
8. Concept of balance nutrition and integrated nutrient management, precision agriculture.

Suggested Readings

1. Balasubramanian 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*. 7thEd. Prentice Hall.
4. Paroda R.S. 2003. *Sustaining our Food Security*. Konark Publ.
5. Reddy SR. 2000. *Principles of Crop Production*. Kalyani Publ.
6. Sankaran S & Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing &Publ.
7. Singh SS. 2006. *Principles and Practices of Agronomy*. Kalyani.

AGRON 503 PRINCIPLES AND PRACTICES OF WEED MANAGEMENT

Time: 3 Hours

Max. Marks: 100

Periods per Week 3+1

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of Section-C are compulsory.

Objective

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

Theory

UNIT I

1. Weed: definition, classification, and losses. Crop-weed competition, Principles and methods of weed control and classification; weed indices. Herbicides introduction and history of their development
2. Herbicides classification; mode and mechanism of action of herbicides. Herbicide structure-activity relationship; factors affecting the efficiency of herbicides.
3. Herbicide formulations, herbicide mixtures; herbicide resistance and management.
4. Weed control through bio-herbicides, myco-herbicides and allelopathy & allelochemicals.

UNIT II

5. Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops and its management; herbicide rotation.
6. Weed management in major field crops, horticultural crops; parasitic weeds.
7. Weed shifts in cropping systems; aquatic and perennial weed control.
8. 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. Calculation of herbicidal requirement
9. Calculation of weed density, WCE and WI

Suggested Readings

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

SOILS 502: SOIL FERTILITY AND FERTILIZER

Time: 3 Hours

Max. Marks: 100

Periods per Week 3+1

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of Section-C are compulsory.

Objective:

To impart knowledge about soil fertility and its control, and to understand the role of fertilizers and manures in supplying nutrients to plants so as to achieve high fertilizer use efficiency.

Theory

UNIT-I

1. Soil fertility and soil productivity; nutrient sources – fertilizers and manures; essential plant nutrients - functions and deficiency symptoms.
2. Soil and fertilizer nitrogen – sources, forms, immobilization and mineralization, nitrification, denitrification; biological nitrogen fixation - types, mechanism, microorganisms and factors affecting.
3. Nitrogenous fertilizers and their fate in soils; management of fertilizer nitrogen in lowland and upland conditions for high fertilizer use efficiency.
4. 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.

UNIT-II

5. Potassium - forms, equilibrium in soils and its agricultural significance; mechanism of potassium fixation; management of potassium fertilizers under field conditions.
6. 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. Micronutrients – critical limits in soils and plants;

factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability.

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

Practical

1. Principles of colorimetry
2. Calculations of fertilizer dose
3. Flame-photometry and atomic absorption spectroscopy
4. Chemical analysis of soil for total and available nutrients
5. Analysis of plants for essential elements

Suggested Readings

1. Brady NC & Weil RR. 2002. *The Nature and Properties of Soils*. 13th Ed. Pearson Edu.
2. Kabata-Pendias A & Pendias H. 1992. *Trace Elements in Soils and Plants*. CRC Press.
3. Kannaiyan S, Kumar K & Govindarajan K. 2004. *Biofertilizers Technology*. ScientificPubl.
4. Leigh JG. 2002. *Nitrogen Fixation at the Millennium*. Elsevier.
5. Mengel K & Kirkby EA. 1982. *Principles of Plant Nutrition*. International PotashInstitute, Switzerland.
6. Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. *Micronutrients in Agriculture*. 2nd Ed. SSSA, Madison.
7. Pierzinsky GM, Sims TJ & Vance JF. 2002. *Soils and Environmental Quality*. 2ndEd.CRC Press.
8. Stevenson FJ & Cole MA. 1999. *Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients*. John Wiley & Sons.
9. Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. *Soil Fertility and Fertilizers*. 5thEd. Prentice Hall of India.

Outline of the Major Course of Agronomy for Semester-II

M.Sc. Agriculture (Agronomy)

Semester-II

Paper Code	Subject	Credit hours		Marks		External Assessment		Internal Assessment		Grand Total
		Theory	Practical	Theory	Practical	Theory	Practical	Theory	Practical	
AGRON-502	AGRONOMY OF MAJOR CEREALS AND PULSES	3	1	75	25	45	25	30	00	100
AGRON-504	PRINCIPLES AND PRACTICES OF WATER MANAGEMENT	3	1	75	25	45	25	30	00	100
AGRON-505	FUNDAMENTALS OF AGRICULTURAL METEOROLOGY	3	1	75	25	45	25	30	00	100
SOILS 501	ANALYTICAL TECHNIQUES AND INSTRUMENTAL METHODS IN SOIL AND PLANT ANALYSIS	0	2	00	100	00	70	00	30	100
STAT-502	EXPERIMENTAL DESIGN	2	1	75	25	45	25	30	00	100
COMP- 501	INTRODUCTION TO INFORMATION TECHNOLOGY	2	1	75	25	45	25	30	00	100
TOTAL		10	07	375	225	225	195	150	30	600

*One credit hour of Practical= 2 hours

*One credit hour of Theory= 1 hour

*One credit hour of Master Research= 1 hour

AGRON-502 AGRONOMY OF MAJOR CEREALS AND PULSES

Time: 3 Hours

Periods per Week 3+1

Max. Marks: 100

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of section-C are compulsory.

Objective

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 following *Rabi* and *Kharif* cereals crop

1. Wheat, rice
2. Barley, maize
3. Sorghum, bajra
4. Minor millets, oat

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 following *Rabi* and *Kharif* pulses crop

5. Pigeon pea, gram
6. Black gram, green gram, cowpea
7. Lentil, mothbean
8. Rajma, cluster bean

Practical

1. Estimation of crop yield on the basis of yield attributes
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2. Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
3. Estimation of protein content in pulses
4. Planning and layout of field experiments
5. Judging of physiological maturity in different 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 to nearby villages for identification of constraints in crop production and prepared report.

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*. IARI, New Delhi.
 7. Pal M, Deka J & Rai RK. 1996. *Fundamentals of Cereal Crop Production*. Tata McGraw Hill.
 8. Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.
 9. Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.
 10. Singh, SS. 1998. *Crop Management*. Kalyani.
 11. Yadav DS. 1992. *Pulse Crops*. Kalyani.
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AGRON 504 PRINCIPLES AND PRACTICES OF WATER MANAGEMENT

Time: 3 Hours

Max. Marks: 100

Periods per Week 3+1

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of section-C are compulsory.

Objective

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

Theory

Unit-I

1. Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.
2. Water availability concept. Soil water movement in soil and plants.
3. Transpiration; soil-water-plant relationships; water absorption by plants.
4. Plant response to water stress, crop plant adaptation to moisture stress condition.

Unit-II

5. Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation.
 6. Micro-irrigation system; fertigation; management of water in controlled environments and polyhouses.
 7. Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency.
 8. 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.
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Practical

1. Measurement of soil water potential by using tensiometer, and pressure plate and membrane apparatus
2. Determination of moisture content in soil
3. Soil-moisture characteristics curves
4. Water flow measurements using different devices
5. Determination of irrigation requirements
6. Calculation of irrigation efficiency
7. Determination of infiltration rate
8. 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*. AgrotechPubl.
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AGRON 505 FUNDAMENTALS OF AGRICULTURAL METEOROLOGY

Time: 3 Hours

Periods per Week 3+1

Max. Marks: 100

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of section-C are compulsory.

Objective

To impart the theoretical and practical knowledge of physical processes occurring in relation to plant and atmosphere with advanced techniques.

Theory

Unit-I

1. Meaning and scope of agricultural meteorology; components of agricultural meteorology; role and responsibilities of agricultural meteorologists. Efficiency of solar energy conversion in dry matter production.
2. Meteorological factors in photosynthesis, respiration and net assimilation; basic principles of water balance in ecosystems; soil water balance models and water production functions.
3. Crop weather calendars; weather forecasts for agriculture at short, medium and long range levels; agromet advisories, preparation, dissemination and economic impact analysis.
4. Use of satellite imageries in weather forecasting; synoptic charts and synoptic approach to weather forecasting.

Unit-II

5. Concept, definition, types of drought and their causes; prediction of drought; crop water stress index, crop stress detection; air pollution and its influence on vegetation.
 6. Meteorological aspects of forest fires and their control; concepts of mechanistic and deterministic models; general features of dynamical and statistical modeling techniques; weather data and phenology-based approaches to crop modeling; validation and testing of models.
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7. Influence of climate on crops. Climatic change, greenhouse effect, CO₂ increase, global warming and their impact on agriculture.
8. Climate classification, agro-climatic zones and agro-ecological regions of India.

Practical

1. Preparation of crop weather calendars
2. Development of simple regression models for weather, pest and disease relation in different crops.
3. Preparation of weather based agro-advisories
4. Use of automated weather station (AWS)

Suggested Readings

1. Bishnoi OP. 2007. *Principles of Agricultural Meteorology*. Oxford Book Co.
 2. Critchfield HJ.1995. *General Climatology*. Prentice Hall of India.
 3. Kakde JR. 1985. *Agricultural Climatology*. Metropolitan Book Co.
 4. Lal DS.1998. *Climatology*. Sharda Pustak Bhawan.
 5. Lenka D.1998. *Climate, Weather and Crops in India*. Kalyani.
 6. Mavi H.S.1994. *Introduction to Agro-meteorology*. Oxford & IBH.
 7. Mavi HS & Tupper GJ. 2004. *Agrometeorology: Principles and Application of Climate Studies in Agriculture*. Haworth Press.
 8. Variraju R & Krishnamurty 1995. *Practical Manual on Agricultural Meteorology*. Kalyani.
 9. Varshneya MC & Balakrishana Pillai P. 2003. *Textbook of Agricultural Meteorology*. ICAR.
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