



UNITED
UNIVERSITY

PRAYAGRAJ

[Established under the U.P. Private Universities Act. No. 12 of 2019]

CURRICULUM & SYLLABI

Master of Science (Ag.) Agronomy

[As per ICAR Fifth (Vth) Dean's committee report]

**FACULTY OF AGRICULTURAL
SCIENCES AND TECHNOLOGY**

COURSE STRUCTURE & EVALUATION SCHEME

M.Sc. (Ag.) Agronomy
[Academic Session 2021-22]



PRAYAGRAJ

[As per ICAR Fifth (Vth) Dean's committee report]

**FACULTY OF AGRICULTURAL
SCIENCES AND TECHNOLOGY**

COURSE STRUCTURE & EVALUATION SCHEME

M.Sc. (Ag.) Agronomy 2 Year (4 Semester) Degree Programme United University, Prayagraj Session 2021-2022

SUMMARY

Sem.	Total No. of Course	L	P	CA	ESE	Total Marks	Credit
I	15 (9+6)	22	12	555	595	1150	26 (20+6)
II	15 (8+7)	17	14	565	585	1150	26 (19+7)
III	17 (9+8)	17	19	590	560	1150	26 (14+12)
Total upto III Sem.	47 (26+21)	56	45	1710	1740	3450	78 (53+25)
IV	Master's Research (Research Work & Dissertation)			1150	-	1150	20 (0+20)
Total				2860	1740	4600	98 (53+45)

L- Lecture, P- Practical, CA- Continuous Assessment, ESE- End Sem. Exam

COURSE STRUCTURE & EVALUATION SCHEME

M.Sc. (Ag.) Agronomy 2 Year (4 Semester) Degree Programme United University, Prayagraj Session 2021-2022

Sr. No	Course Code	Course Title	Teaching		Evaluation Scheme			Credit
			L	P	CA	ESE	Total	
SEMESTER- I								
1	AGPCMG101T	Principles & Practices of Weed Management	2	-	40	60	100	2
2	AGPCMG102T	Research Methodology	2	-	40	60	100	2
3	AGPCMG103T	Principles & Practices of Soil Fertility & Nutrient Management	2	-	40	60	100	2
4	AGPCMG104T	Experimental Design	2	-	40	60	100	2
5	AGPCMG105T	Modern Concepts in Crop Production	4	-	40	60	100	3
6	AGPCMG106T	Disaster Management	1	-	20	30	50	1
7	AGPCMG107T	Master's Seminar-I	1	-	100	-	100	1
8	CASAGMA10T	Fundamentals of Computer & Applications	4	-	40	60	100	3
9	PTSPMMG10T	Professional Proficiency (M.Sc. Ag.)- I	4	-	50	50	100	4
10	AGPCMG101P	Principles & Practices of Weed Management Practical	-	2	25	25	50	1
11	AGPCMG102P	Research Methodology Practical	-	2	25	25	50	1
12	AGPCMG103P	Principles & Practices of Soil Fertility & Nutrient Management Practical	-	2	25	25	50	1
13	AGPCMG104P	Experimental Design Practical	-	2	25	25	50	1
14	CASAGMA10P	Fundamentals of Computer & Applications Practical	-	2	25	25	50	1
15	PTSPMMG20T	Technical Writing And Communication Skills		2	20	30	50	1
Total			22	12	555	595	1150	26

Sr. No.	Course Code	Course Title	Teaching		Evaluation Scheme			Credit
			L	P	CA	ESE	Total	
SEMESTER-II								
1	AGPCMG201T	Agronomy of Major Cereals and Pulses	2	-	40	60	100	2
2	AGPCMG202T	Agronomy of Oilseed, Fibre and Sugar Crops	2	-	40	60	100	2
3	AGPCMG203T	Agronomy of Medicinal, Aromatic and Under-utilized Crops	2	-	40	60	100	2
4	AGPCMG204T	Agrometeorology & Crop Weather Forecasting	2	-	40	60	100	2
5	AGPCMG205T	Soil Fertility and Plant Nutrition	2	-	40	60	100	2
6	AGPCMG206T	Principles and Practices of Water Management	2	-	40	60	100	2
7	AGPCMG207T	Master's Research (Synopsis Presentation)	1	-	100	-	100	5
8	PTSPMMG20T	Professional Proficiency (M.Sc. Ag)- II	4	-	50	50	100	2
9	AGPCMG201P	Agronomy of Major Cereals and Pulses Practical	-	2	25	25	50	1
10	AGPCMG202P	Agronomy of Oilseed, Fibre and Sugar Crops Practical	-	2	25	25	50	1
11	AGPCMG203P	Agronomy of Medicinal, Aromatic and Under-utilized Crops Practical	-	2	25	25	50	1
12	AGPCMG204P	Agro meteorology & Crop Weather Forecasting Practical	-	2	25	25	50	1
13	AGPCMG205P	Soil Fertility and Plant Nutrition Practical	-	2	25	25	50	1
14	AGPCMG206P	Principles and Practices of Water Management Practical	-	2	25	25	50	1
15	AGPCMG208P	Basic Concepts in Laboratory Techniques Practical	-	2	25	25	50	1
Total			17	14	565	585	1150	26

Sr. No.	Course Code	Course Title	Teaching		Evaluation Scheme			Credit
			L	P	CA	ESE	Total	
SEMESTER- III								
1	AGPCMG301T	Agronomy of Fodder & Forage Crops	2	-	40	60	100	2
2	AGPCMG302T	Cropping Systems & Sustainable Agriculture	2	-	40	60	100	2
3	AGPCMG303T	Dryland Farming & Watershed Management	2	-	40	60	100	2
4	AGPCMG304T	Principles & Practices of Organic Farming	2	-	40	60	100	2
5	AGPCMG305T	Agrostology and Agroforestry	2	-	20	30	50	1
6	AGPCMG306T	Intellectual Property and its Management in Agriculture	1	-	20	30	50	1
7	AGPCMG307T	Agricultural Research, Research Ethics and Rural Development Programs	1	-	20	30	50	1
8	AGPCMG308T	Master's Seminar-II	1	-	50	-	50	1
9	PTSPMMG30T	Professional Proficiency (M.Sc. Ag.)- III	4	-	50	50	100	2
10	AGPCMG309P	Master's Research (Dissertation Work)	-	5	100	-	100	5
11	AGPCMG310P	Library and Information Services	-	2	20	30	50	1
12	AGPCMG301P	Agronomy of Fodder & Forage Crops Practical	-	2	25	25	50	1
13	AGPCMG302P	Cropping Systems & Sustainable Agriculture Practical	-	2	25	25	50	1
14	AGPCMG303P	Dryland Farming & Watershed Management Practical	-	2	25	25	50	1
15	AGPCMG304P	Principles & Practices of Organic Farming	-	2	25	25	50	1
16	AGPCMG305P	Agrostology and Agroforestry Practical	-	2	25	25	50	1
17	AGPCMG311P	Excursion Visit (Agro-Industry)	-	2	25	25	50	1
Total			17	19	590	560	1150	26

SEMESTER- IV

1	AGPCMG401P	Master's Research (Dissertation Work) (M.Sc. AG.)		20	-	-	1150	20
		Total	-	20	-	-	1150	20

COURSE STRUCTURE & EVALUATION SCHEME

M.Sc. (Ag.) Agronomy 2 Year (4 Semester) Degree Programme United University, Prayagraj Session 2021-2022

Guidelines on Continuous Assessment (CA)

(upto first three semester courses)

Continuous Assessment (CA) of a course with weightage 40% comprises of two components (a) **Class Tests** (b) **Teacher Assessment**.

- (a) **Class Tests (20% marks):** There should be 2-3 class tests of at least one hour in each paper. First test normally covers upto 40% of the course.
- (b) **Teacher Assessment (20% marks):** is normally based on Viva, Practical and field work, Credit Seminar and its presentation and or Presentation on topics of the subject which may also be related to research field of different agricultural & allied sector.

Guidelines on Evaluation and Assessment Scheme of M.Sc. **research work (dissertation) of IV Semester** are available separately.

SYLLABUS

FOR

AGRICULTURAL SCIENCES AND TECHNOLOGY

[M.Sc. Agronomy]

(First Semester)



PRAYAGRAJ

**FACULTY OF AGRICULTURAL
SCIENCES AND TECHNOLOGY**

Syllabus for M.Sc. Agronomy

Course Title: PRINCIPLES AND PRACTICES OF WEED
MANAGEMENT

Course Code: AGPCMG101T

Semester: I

L	T	P	C
2	0	0	2

Objective:

The prominent aim of this course is to provide the knowledge about the weeds cause financial losses, skillful management to reduce the impact of weeds, herbicides and methods of weed control with addition of benefit derived from the management of weeds.

Course Syllabus (Theory)

Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices. Herbicides- introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides. Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management; weed control through bio-herbicides, myco-herbicide and allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation. Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control. Integrated weed management; cost: benefit analysis of weed management.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Crop weed competition and Weed control Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices. Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity.	8
2	Herbicide structure and resistance Mode and mechanism of action of herbicides. Herbicide structure- activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management.	8
3	Bio-herbicide Weed control through bio-herbicides, myco-herbicide and allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation.	8
4	Integrated weed management Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control. Integrated weed management; cost: benefit analysis of weed management.	8

Course Outcomes

- Student will be able to understand the weed biology, concept of weed control along with its classification and herbicides.
- Student will be able to understand the mechanism of herbicides, herbicide formulations along with herbicide resistance in to the plant.
- Student will be able to understand the concept of herbicide in weed control along with herbicides resistance in weed and crops.
- Student will be able to understand the parasitic weed, aquatic weed and perennial weed in addition to integrated weed management and able to analysis of cost benefit.

Recommended Text Books/ Reference Books

- Weed Management Hand Book- Naylor. 2002. Blackwell Publishing.
- Principles in Weed Management- RJ Aldrich & RJ Kramer. 1997. Panima Publ. corporation.
- Modern Weed Management- OP. Gupta. 2008. Agrobios.
- Weed Management- VN Sarswat, VM Bhan & NT. Yaduraju. 2003. ICAR.
- Fundamentals of Weed Science- RL. Zimdahl. 1999. 2nd Ed. Academic Press.

Syllabus for M.Sc. Agronomy

- Mode of Action of Herbicides- FM Ashton & AS Crafts. 1981. 2nd Ed. Wiley Inter-Science.
- Principles of Weed Science- VS Rao. 2000. Oxford & IBH.
- Sustainable Weed Management- HP Singh, DR Batish & RK Kohli. 2006. Food Products Press - An imprint of The Haworth Press Inc.
- Herbicide Bioassay- JC Streibig & P Kudsk. 1993. CRC Press Inc.

Syllabus for M.Sc. Agronomy

Course Title: PRINCIPLES AND PRACTICES OF WEED
MANAGEMENT LAB

Course Code: AGPCMG101P

Semester: I

L	T	P	C
0	0	2	1

Objective:

The prime aim of this lab is to explore the knowledge of weed & herbicide identification, formulation and better way of management to enhance the yield of crops.

- The course will consists of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing

Course Syllabus (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, Calculation of herbicidal requirement.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Identification of important weeds of different crops	Common name (English/ Local), Scientific name, Group, Family, Salient characteristics.	2
Preparation of a weed herbarium	Collection of weed sample, Pressing and drying of collected specimen, Poisoning, Mounting on herbarium sheet, Preparation and fixing of identification label, Preservation.	4
Weed survey in crops and cropping systems	Conveyance to visit area, Site, 10 minimal sample area , Size 0.5 m x 0.5 m or 1.0 m x 1.0, Quadrat, Calculate % occurrence of weeds.	4
Crop-weed competition studies	Concept, Component of the overall competitive effect, Competition for nutrients, Competition for light, Competition for Moisture, Factors affected crop weed competition.	2
Preparation of spray solutions of herbicides for high and low-volume sprayers	Dose calculations, Field crops, Aquatic weeds, Rectangular water bodies, For Spherical water bodies, Flowing canals or channels.	4
Use of various types of spray pumps and nozzles and calculation of swath width	Manually operated, Compressed air sprayer, Hydraulic sprayer, Power operated, Hand atomizer, Bucket type, Knapsack, Boom-type field sprayers, Field sprayer calibration, Nozzles; Flat fan, Flood jet, Cone.	4
Economics of weed control	Cost of cultivation, Gross returns, Net returns, Net returns per rupee invested, Cost of weed control, Gross return due to weed control, Net return due to weed control.	4
Herbicide resistance analysis in plant and soil	Resistant weed, Prevent seed production, Moving seed or Vegetative propagules.	4
Bioassay of herbicide resistance, Calculation of herbicidal requirement	Time of Application, Concentration of herbicides, Formulation of Herbicides, Method of Application, Calculating Proper Quantities of Herbicides, Acid Equivalent.	4

Course Outcomes

- Skilled on identification of important weed plant along with preparation of weed herbarium.
- Student will be able to understand the concept of weed survey in different crops along with the crop weed competition.
- Skilled on preparation of spray solution of herbicides for sprayers with uses of various types of nozzles and sprayers.
- Study the economics of weed control and skilled on herbicide resistance analysis with calculation of herbicide requirement.
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Syllabus for M.Sc. Agronomy

Course Title: RESEARCH METHODOLOGY

Course Code: AGPCMG102T

Semester: I

L	T	P	C
2	0	0	2

Objective

The prime aim of the course is to explore the knowledge of students on research methodology used in social sciences. The focus will be on providing knowledge related to research process, data collection and data analysis etc.

Course Syllabus (Theory)

Importance and scope of research in agricultural economics. Types of research- Fundamental vs. Applied. Concept of researchable problem– research prioritization– selection of research problem. Approach to research– research process. Data collection– assessment of data needs– sources of data collection– discussion of different situations. Mailed questionnaire and interview schedule– structured, unstructured, open ended and closed-ended questions. Scaling Techniques. Preparation of schedule– problems in measurement of variables in agriculture. Interviewing techniques and field problems - methods of conducting survey– Reconnaissance survey and Pre testing. Sampling theory and sampling design– sampling error- methods of sampling– probability and non- probability sampling methods- criteria to choose. Project proposals- contents and scope- different types of project to meet different needs- trade-off between scope and cost of the study. Research design and techniques– Types of research design. Hypothesis– meaning- characteristics- types of hypothesis– review of literature– setting of Course Objective and hypotheses- testing of hypothesis. Coding editing- tabulation- validation of data. Tools of analysis- data processing. Interpretation of results- Preparing research report/ thesis– Universal procedures for preparation of bibliography– writing of research articles.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Scope of research and Approach to research Importance and scope of research in agricultural economics. Types of research- Fundamental vs. Applied. Concept of researchable problem– research prioritization– selection of research problem. Approach to research– research process.	8
2	Data collection and Measurement of Variables Data collection– assessment of data needs– sources of data collection– discussion of different situations. Mailed questionnaire and interview schedule– structured, unstructured, open ended and closed-ended questions. Scaling Techniques. Preparation of schedule– problems in measurement of variables in agriculture.	8
3	Survey and Sampling Interviewing techniques and field problems- methods of conducting survey– Reconnaissance survey and Pre testing. Sampling theory and sampling design– sampling error- methods of sampling– probability and non-probability sampling methods- criteria to choose.	8
4	Research design and Hypothesis Project proposals- contents and scope- different types of project to meet different needs- trade-off between scope and cost of the study. Research design and techniques– Types of research design. Hypothesis– meaning- characteristics- types of hypothesis– review of literature– setting of Course Objective and hypotheses- testing of hypothesis. Coding editing- tabulation- validation of data. Tools of analysis- data processing. Interpretation of results- Preparing research report/ thesis– Universal procedures for preparation of bibliography– writing of research articles.	8

Course Outcomes

- Understand the basic concept of research, research problems along with the parameters and approaches of research.
- Student will be able on data collection and its others aspects with their schedule and measurement of variables in agriculture.
- Skilled on survey of agriculture *i.e.* interviewing techniques, problems with sampling of design and methods of sampling.

- Student will be skilled on design of research, its type and able on preparing research report with improved skills of writing research articles.

Recommended Text Books / Reference Books

- Research Methodology- Methods and Techniques- CR. Kothari. 2004. Wishwa Prakashan, Chennai.
- Introduction to Research Methodology in Agricultural and Biological Sciences- V. Venkatasubramanian. 1999. SAGE Publ.
- Research Design- Qualitative and Quantitative Approaches- JW. Creswell. 1999. SAGE Publ.
- Research Methodology in Social Sciences and Essentials of Thesis Writing- SP. Dhondyal. 1997. Amman Publ. House, New Delhi.
- Research Methodology in Commerce and Management- KV. Rao. 1993. Sterling Publ., New Delhi.
- Tests, Measurements and Research Methods in Behavioural Sciences- AK. Singh. 1993. Tata McGraw-Hill.
- Evaluating Social Science Research- An Introduction- TR. Black. 1993. SAGE Publ.

Syllabus for M.Sc. Agronomy

Course Title: RESEARCH METHODOLOGY LAB

Course Code: AGPCMG102P

Semester: I

L T P C
0 0 2 1

Objective:

The main aim of this lab is to acquaint the students on basic concepts of research and processes, design of research and qualitative and quantitative data collection methods along with dissertation design and results findings

- The course will consists of lecture (both theory and practical) in the lab.
- Highlights the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of assigned practical.
- Aim of study to practically expertize the student on eager to learn scale.

Course Syllabus (Practical)

Exercises in problem identification. Project proposals– contents and scope. Formulation of Objective and hypotheses. Assessment of data needs– sources of data– methods of collection of data. Methods of sampling– criteria to choose– discussion on sampling under different situations. Scaling Techniques- measurement of scales. Preparation of interview schedule- Field testing. Method of conducting survey. Exercise on coding, editing, tabulation and validation of data. Preparing for data entry into computer. Hypothesis testing- Parametric and Non- Parametric Tests. Exercises on format for Thesis / Report writing. Presentation of the results.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Exercises in problem identification	Types of research Problem, Sources of Problems, Formulation of Research Questions, Multiple Perspective, Research ability, Characteristics of research question, Feasible, Ethical.	2
Project proposals– contents and scope	Statements, Introduction / Problem Statement, Objectives, Work Plan, Basic Research, Applied Research, Test and Evaluation, Anticipated Benefits, Implementation, Expected Deliverables, Time Schedule, Literature Cited, References, Budget, Justification.	2
Formulation of objective and hypotheses	Operationalised study, Primary and Secondary objectives, Priorities (limit) objectives, Active language, Characteristics, sample size calculation, Appropriate design, Analysis.	4
Assessment of data needs– sources of data– methods of collection of data	Operational Questions, Need based on questions, Feed the data, Good metric for determining, Approaches to data collection.	4
Methods of sampling– criteria to choose– discussion on sampling under different situations	Probability sampling, Non-probability sampling, Types of probability sampling, Four types of probability sampling techniques, Uses of probability sampling, Types of non-probability sampling, Uses of non-probability sampling.	4
Scaling Techniques measurement of scales	Four levels of measurements; Nominal, Ordinal, Interval, Ratio.	2
Preparation of interview schedule- Field testing. Method of conducting survey	The opening, The body; The closing, Identify the audience, Survey provider, Conduct the survey, Context for the survey, Evaluate research.	2
Exercise on coding, editing, tabulation and validation of data	Survey Management, Data Capture, Data Review, Data Adjustment. Rules of tabulation, Ideal Table, Simple tabulation, Double tabulation, Complex tabulation.	4

Preparing for data entry into computer	Logging the Data, mail surveys returns, Coded interview data, Pretest or posttest data, Observational data, Checking the Data For Accuracy, Database Structure, Data Transformations, Missing values, Item reversals, Scale totals.	2
Hypothesis testing Parametric and Non-Parametric Tests	Normal distribution, Curve, Mean, Standard deviation, Variance of the data. Null hypothesis, Nominal and ordinal data, Quantitative data, Distribution curve.	2
Exercises on format for Thesis / Report writing	Working with Assigned Topics, Standard title, Abstract, Research problem, Methodology, Key results, Conclusion, Table of contents, List of figures, List of tables.	2
Presentation of the results	Three main formats: Oral presentation, Poster presentation, Written paper, Introduction, Materials and Methods, Results, Discussion, Acknowledgments.	2

Course Outcomes

- Skilled on problem identification of research with preparation of project proposal result.
- Understand the formulation of primary and secondary objective along with characteristics and collection of data with their sources.
- Student will be skilled on sampling methods under different situation and interview schedule along with conducting agriculture-based survey work.
- Skilled on writing of thesis, data entry and hypothesis of research work in addition with result presentation.

Syllabus for M.Sc. Agronomy

Course Title: PRINCIPLES & PRACTICES OF SOIL
FERTILITY & NUTRIENT
MANAGEMENT

Course Code: AGPCMG103T

Semester: I

L T P C
2 0 0 2

Objective:

To explore the knowledge of students on fertilizers and manures as sources of plant nutrients in addition of integrated approach of crop nutrition with soil fertility evaluation and sustainability of soil fertility.

Course Syllabus (Theory)

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. Criteria of essentiality of nutrients; Essential plant nutrients– their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients. 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. 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. 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 vermicompost and residue wastes in crops.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Soil fertility and Organic farming 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.	8
2	Essential plant nutrients and Organic fertilizers Criteria of essentiality of nutrients; Essential plant nutrients– their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients. Preparation and use of farmyard manure, compost, green manures, vermicompost, biofertilizers and other organic concentrates their composition.	8
3	Commercial fertilizers and Crop response Availability and crop responses; recycling of organic wastes and residue management. Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades.	8
4	Methods of fertilizers application and Integrated nutrient management Agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions. 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 vermicompost and residue wastes in crops.	8

Course Outcomes

- Student will be understand the concept of fertility and productivity of soil and crop growth with their factors affecting along with concept of organic farming.
- Study the essential crop nutrient and able to understand their function in growth of plants with preparation of organic manure and their composition.
- Student will be able to understand the concept of recycling of organic waste, commercial fertilizers and crop response along with fertilizer use efficiency.
- Understand the methods of fertilizer/ manure application, foliar spray with their concept and time with addition of integrated nutrient management.

Recommended Text Books / Reference Books

- The Nature and Properties of Soils- Brady NC & Weil R.R. 2002. 13th Ed. Pearson Edu.
- Growth and Mineral Nutrition of Field Crops- Fageria NK, Baligar VC & Jones CA. 1991. Marcel Dekker.
- A Hand Book of Soil, Fertilizer and Manures- Gupta PK. 2007. Agribios.
- Soil Fertility and Fertilizers. 7th Ed- Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. Prentice Hall.
- Soil Fertility Management for Sustainable Agriculture- Prasad R & Power JF. 1997. CRC Press.
- Efficient Use of Fertilizers- Somani LL. 1996. Agrotech Publishing Academy.
- Manures and Fertilizers- Yawalkar KS, Agrawal JP & Bokde S. 2000. Agri Horti Publ.

Syllabus for M.Sc. Agronomy

Course Title: PRINCIPLES & PRACTICES OF SOIL
FERTILITY & NUTRIENT MANAGEMENT
LAB

Course Code: AGPCMG103P

Semester: I **L T P C**
0 0 2 1

Objective:

The prominent aim of this lab is to teach the student various organic fertility sources and best use practices, along with soil management practices for soil health and fertility in sustainable manner/form.

- The course will consists of lecture (both theory and practical) in the lab.
- Highlights the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of assigned practical.
- Aim of study to practically expertize the student on eager to learn scale.

Course Syllabus (Practical)

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

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Determination of soil pH	Reagents; Buffer Solution of pH 4.0, 7.0 and 9.2, Distilled water, Reagents, Soil to water ratio 1:2, Saturates soil paste, Saturation extract.	4
Determination of soil EC	Potassium chloride, Distilled water, Soil sample, Conductivity meter.	4
Determination of soil organic Carbon	Walkley- Black Method, Reagents, 2.00 g dried soil, K ₂ Cr ₂ O ₇ , H ₂ SO ₄ , Water, H ₃ PO ₄ or NaF, Ferroin indicator, Calculate % organic C and % organic matter.	4
Determination of soil total Nitrogen	Catalyst mixture, Potassium sulphate, Copper sulphate and selenium powder (ratio 50:10:1), Sodium hydroxide, Boric acid, Mixed indicator and sulphuric acid, Digestion, Distillation and titration.	4
Determination of available N,P, K in soil	Reagent: KMnO ₄ solution, NaOH solution, H ₂ SO ₄ , Methyl red indicator, Procedure, Observation. Colorimetric measurement, Reagent, Sodium bicarbonate solution, Activated charcoal, Sulphuric acid solution, Reagent A, Reagent B, Phosphate Solution, Standard curve. Reagent, Neutral normal ammonium acetate, Standard potassium solution, Preparation of standard curve, Wet digestion, Determination of K. spectrophotometer and flame-photometer.	4
Determination of Sulphur in soils	Reagents; Mono-calcium phosphate, Gum acacia acetic acid, Barium chloride, Stock solution, Barium sulphate, Procedure, Turbidimetric method, Standard curve, Digestion of plant material, Estimation.	4
Determination of total N, P, K and S in plants	Micro Kjeldahl method, Procedure, Digestion, Distillation, Titration, Crude protein content, Standard curve, Turbidimetric method.	4
Interpretation of interaction effects and computation of economic and yield optima	Two or more growth factors, Positive interaction (Liebig's law of the minimum), Negative interactions (Lime x P, lime x Mo, Mo x P, and Na x K), No interaction, Interpretation, Exercises, Solution.	4

Syllabus for M.Sc. Agronomy

Course Outcomes

- Skilled on determination of soil pH, soil EC and organic carbon along with total available nitrogen in soil as per recommended scientific methods.
- Student will be able to determine the available NPK and Sulphar in soil.
- Skilled on determination of total NPK and Sulphar available in plants by recommended methods along with its nutrient interaction effect and yield optima.

Syllabus for M.Sc. Agronomy

Course Title: EXPERIMENTAL DESIGN

Course Code: AGPCMG104T

Semester: I

L T P C
2 0 0 2

Objective:

The prominent aim of the study is to ensure that the right type of data, sufficient sample size and power are available to answer the research questions of interest as clearly with efficiently as possible in aspect of agricultural scientific study.

Course Syllabus (Theory)

Analysis of variance: Definition and assumptions, one way classification, two way classification.
Sampling Techniques: Simple random sampling, stratified random sampling, systematic sampling.
Design Experiments: Randomized Block design, Latin Square design, Factorial design (2^2 , 2^3 , 3^2 , 3^3 factorials), Some P x Q experiments, Split Plot Experiments. Balanced Incomplete Block design.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Analysis of Variance Analysis of variance: Definition and assumptions, one way classification, two way classification.	8
2	Sampling Techniques Sampling Techniques: Simple random sampling, stratified random sampling, systematic sampling.	8
3	Design Experiments Design Experiments: Randomized Block design, Latin Square design, Factorial design (2^2 , 2^3 , 3^2 , 3^3 factorials).	8
4	Split Plot Experiments Some P x Q experiments, Split Plot Experiments. Balanced Incomplete Block design.	8

Course Outcomes

- Understand the analysis of variance with definition and assumption along with one way classification and two way classifications.
- Understand the basic of sampling with their trials and probability along with efficiency of different types of sampling.
- Student will be able to work on design of experiment with Randomized block design, Latin square design, factorial experiments and their relationship between factors affecting a process and the output of that process.
- Understand the split plot design and its uses in agriculture field along with two levels of experimental units and their sub plot experimental units.

Recommended Text Books/ Reference Books

- Statistical Procedures for Agricultural Research- K.A. Gomez and A.A. Gomez. 1984. John Wiley and Sons.
- Principles and Procedures of Statistics- R.G.D. Steel and J.H. Torrie. 1960. McGraw – Hill Book Co., New Delhi.
- Statistical Methods for Agricultural Workers- V.G. Panse and P.V. Sukhtame. 1985. ICAR, New Delhi.
- Experimental Designs- W.G. Cochran and G.M.Cox.1957. A Wiley International Edition. Canada.
- Design and Analysis of Experiments- Dean AM & Voss D. 1999. Springer. Federer WT. 1985. Experimental Designs. MacMillan.
- Design and Analysis of Experiments- Fisher RA. 1953. Oliver & Boyd.
- Handbook on Analysis of Agricultural Experiments- Nigam AK & Gupta VK. 1979. IASRI Publ.
- The Agricultural Field Experiment: A Statistical Examination of Theory and Practice- Pearce SC. 1983. John Wiley & Sons.

Syllabus for M.Sc. Agronomy

Course Title: EXPERIMENTAL DESIGN LAB

Course Code: AGPCMG104P

Semester: I

L T P C
0 0 2 1

Objective:

The prime aim of this course is to teach and practically skilled the student on appropriate use of balanced and unbalanced designs, proper consideration of years and locations, use of research data, value of variables and problems associated with field experiments versus those associated with controlled environments such as greenhouses and molecular labs.

- The course will consist of lecture (both theory and practical) in the lab.
- Highlight the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of lab experiments.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Analysis of variance, Randomized Block Design, Analysis of 2^2 and 2^3 experiments in R.B.D., Analysis of AxB factorial experiments. Analysis of AxBxC factorial experiments, Complete confounding in case of 2^3 experiments, Partial confounding in case of 2^3 experiments, Missing plot analysis in case of R.B.D. with one observation missing, Missing plot analysis in case of L.S.D. with one observation missing. Analysis of Split plot and Strip plot design, Analysis of Covariance in case of R.B.D. Use of data transformations.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Analysis of variance	Introduction to ANOVA, Terminologies, One-way ANOVA, Two-way ANOVA, MANOVA.	2
Randomized Block Design	Layout of the Experiment, Analysis, Model, ANOVA Table.	2
Analysis of 2^2 and 2^3 experiments in R.B.D	Two factors, Two levels, Total number of treatment combinations, R.B.D., Three factors, Two levels, Replication, Layout of experiment, Analysis.	2
Analysis of AxB factorial experiments	Factor, Level, arrangement, Simple Effects, Main Effects, Interactions, ANOVA for a 2x2 Factorial.	2
Analysis of AxBxC factorial experiments	Three grouping factors, Independent variables, Dependent variable, Three way interaction, Analysis of Variance.	2
Complete confounding in case of 2^3 experiments	Introduction, Factorial experiments, Symmetrical factorial experiments, Asymmetrical factorial experiments, Steps of Analysis. Experiments of factor each at three levels.	2
Partial confounding in case of 2^3 experiments	Treatment Combination, Normal Probability Plot, Variance Table, Interaction Plot, Balance Incomplete Block Design.	4
Missing plot analysis in case of R.B.D	One Missing Plot, Two Missing Plots, ANOVA Table, Suitability of RBD, Advantages and Disadvantages of RBD.	4
Missing plot analysis in case of L.S.D. with one observation missing	Experimental design, Incomplete Latin square, ANOVA, General linear model.	4
Analysis of Split plot and Strip plot design	Introduction, Degree of precision, Relative size of the main effect, Management practices, Model, Analysis, ANOVA Introduction, Randomization and Layout, Model, Analysis, ANOVA, Standard errors, Critical differences.	4
Analysis of Covariance in case of R.B.D	ANOVA tables, Independent variable or covariate, Dependent variable, F-test, Calculate sums, Analysis of Covariance table.	2
Use of data transformations	Box-Cox transformations, Design of experiments, Expectations, Normal probability plot, Residuals.	2

Course Outcomes

- Understand the basic of RBD with designing, observation/ measurement and analysis of data with factorial experiments.
- Understand the three grouping factors and three way analysis, interaction along with symmetrical and asymmetrical factorial experiments.
- Study the advantages and disadvantages of confounding along with missing plot techniques in RBD & LSD with one observation missing.
- Student will be able to understand the split plot design and ANOVA with data analysis, covariance in RBD and its transformation.

Syllabus for M.Sc. Agronomy

Course Title: MODERN CONCEPT IN CROP
PRODUCTION

Course Code: AGPCMG105T

Semester: I

L T P C
4 0 0 3

Objective:

The aim of the study is to explore the knowledge to get the maximum seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management with soil management and crop production.

Course Syllabus (Theory)

Crop growth analysis in relation to environment; agro-ecological zones of India. Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit. 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. Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress. 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.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Crop growth analysis Crop growth analysis in relation to environment; agro-ecological zones of India. Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.	16
2	Plant population and Planting Geometry 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. Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress.	16
3	Organic Farming and Nutrient Management 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.	16

Course Outcomes

- Study the basic principle of agronomy, field management and fertilizers.
- Study the crop growth analysis along with yield equation and its interpretation.
- Student will be able to understand the effect of lodging, effective uses of plant geometry along with crop modeling and soil plant relations.
- Student will be able to understand the concept of integrated farming, organic farming and integrated nutrient management.

Recommended Text Books/ Reference Books

- Modern Concepts And Advances Principles In Crop Production- SC Panda, Agrobios (India).
- Principles of Crop Production- SR. Reddy. 2000. Kalyani Publishers.
- Principles of Agronomy- S. Sankaran & TVS. Mudaliar. 1997. The Bangalore Printing & Publ.
- Principles and Practices of Agronomy- SS. Singh. 2006, Kalyani Publishers.
- Principles and Practices of Agronomy- P Balasubramaniyan & SP Palaniappan. 2001. Agrobios.
- Maximizing Crop Yields- NK. Fageria. 1992. Marcel Dekker.
- Soil Fertility and Fertilizers- JL Havlin, JD Beaton, SL Tisdale & WL Nelson. 2006. 7th Ed. Prentice Hall.
- Principles of Genetics- Phundan Singh, Kalyani Publishers.

Syllabus for M.Sc. Agronomy

Course Title:	DISASTER MANAGEMENT (e-Course)	Course Code:	AGPCMG106T								
Semester:	I		<table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 0 5px;">L</td> <td style="padding: 0 5px;">T</td> <td style="padding: 0 5px;">P</td> <td style="padding: 0 5px;">C</td> </tr> <tr> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">1</td> </tr> </table>	L	T	P	C	1	0	0	1
L	T	P	C								
1	0	0	1								

Objective:

The prime aim of this course to build the knowledge on Natural/ environmental disaster, Man Made Disaster, causes and its negative effects along with remedies to overcome disasters and skilled on management with create sense of social responsibilities.

Course Syllabus (Theory)

Natural Disaster management and nature of natural disasters, their types and effect. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Natural Disaster and Climate Change Natural Disaster management and nature of natural disasters, Their types and effect. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion.	6
2	Man Made Disaster and Management Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction.	6
3	Role of NGOs and Administration in Disaster Management Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community- based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.	4

Course Outcomes

- Understand the basics of natural disaster and their types and impact on property, financial resources and injury or illness along with climate change and its impact on human being.
- Study the anthropogenic disaster and event such as gas leaks, oil spills, nuclear meltdowns, and industrial fires transpire through human error and its impact on environment.
- Student will be able to understand the concept of disaster management and role of community organizations, media along with administration in disaster management.

Recommended Text Books/ Reference Books

- Disaster Management- Gupta HK. 2003. Indian National Science Academy. Orient Blackswan.
- Textbook of Disaster Management- Dr Nitesh Kumar, Satish Serial Publishing House.
- Disaster Management- Harsh K. Gupta, Universities Press (India) Limited.
- Coping with Catastrophe: A Handbook of Disaster Management- Peter E. Hodgkinson, Michael Stewart, Routledge.
- Disaster Management- Sharma VK, National Centre for Disaster Management, India.
- Disaster management with special reference to uttarakhand (1st edition)- Dr. Jayant Gangrediwar. 2014. SBW Publishers.
- Disaster Management Handbook- Jack Pinkowski, CRC Press, Taylor and Francis Group.
- Geographic Information Systems (GIS) for Disaster Management- Brian Tomaszewski, CRC Press, Taylor and Francis Group.

Syllabus for M.Sc. Agronomy

Course Title: MASTERS SEMINAR

Course Code: AGPCMG107T

Semester: I

L	T	P	C
1	0	0	1

Objective

The aim of this seminar to explore the knowledge of students through the presentation on selected topic from field crops, crop nutrition, manure and fertilizers, Irrigation water management, weed & herbicidal management with crop rotation.

Course Syllabus (Presentation)

Soil, Tillage and Soil and water conservation, Rainfed Agriculture, watershed management, Irrigation water management, Weed management, Farming System and sustainable agriculture, Organic farming, Soil fertility, manures and fertilizers, Geoinformatics, Nanotechnology for precision farming.

Objective:

The prominent aim of the study is to provide the fundamental knowledge of Computer hardware, software with its application and DOS keys to the students. In addition, this course is designed to provide hands on learning of updated applications and automated systems in agri-businesses & its Applications. This enables agriculture post- graduates to use computer resources efficiently for effective decision making in a Seed Company, Fertilizer Company, Agro-Industries/ Dairy & Poultry based Industries /Corporate/ CSR project to cope up with current Industries/ business scenarios.

Course Syllabus (Theory)

Introduction to Computers, Computer Generations, Input and Output Devices. Units of Memory, Hardware, Software and Classification of Computers. Personal Computers, Operating System–WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders, starting and shutting down of WINDOWS. Anatomy of a WINDOW, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars. Introduction of Internet: History of internet, Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails. MS Word: Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge. MS Excel: Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping, Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets. MS Power Point: Introduction of power point, tool animation, templates, Designing presentation, Slide Show control, Starting MS–Power Point, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents. MS– Access: creating table and database. Internet based Agri-Business Systems, Cyber Crime and Privacy Issues, Cyber Laws, IT Act.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Computer and Windows Introduction to Computers, Computer Generations, Input and Output Devices. Units of Memory, Hardware, Software and Classification of Computers. Personal Computers, Operating System – WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders, starting and shutting down of WINDOWS.	12
2	Internet and MS Word Anatomy of a WINDOW, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars. Introduction of Internet: History of internet, Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails. MS Word: Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects. Page setup, Page Preview, Printing a document, Mail Merge.	12
3	MS Excel and Functions MS Excel: Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping, Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets.	12
4	MS Power Point and Cyber law MS Power Point: Introduction of power point, tool animation, templates, Designing presentation, Slide Show control, Starting MS–Power Point, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents. MS– Access: creating table and database. Internet based Agri-Business Systems, Cyber Crime and Privacy Issues, Cyber Laws, IT Act	12

Course Outcomes

- Student will be able to understand the fundamental of computer and its input, output devices along with the windows operating system.
- Student will be able to understand the concept of internet and skilled on MS world along with creation of different types of format, file, worksheets, presentations, email and recognize email netiquette.
- Understand the MS- Excel and Generating graphs, Worksheet data and charts with WORD document and their role in application program.
- Student will be able to get insight of MS Power Point with slide show and MS access along with internet based agri-business system and cyber law.

Recommended Text Books/ Reference Books

- Computer Fundamentals- Sinha P.K., BPB Publishing.
- Computer Fundamentals- Anita Goel, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, New Delhi.
- The Essentials Office 2000 Book- Bill Bruck, BPB Publishing.
- Introductions to Computers- Alexis Leon & Mathews Leon, Vikas Publications.
- Introductions to Computers- Peter Norton S., Tata McGraw Hill.
- Office in Easy Steps- Price Michael, TMH Publication.
- Computer Networks & Internets: With Internet Applications- D. E .Comer, M. S. Narayanan, Update edition, Pearson Education, New Delhi.
- Computer Networks & Distributed Processing: Software, Techniques & Architecture-Martin, James, Prentice Hall PTR.

Syllabus for M.Sc. Agronomy

Course Title: FUNDAMENTALS OF COMPUTER & APPLICATIONS LAB

Course Code: CASAGMA10P

Semester: I

L	T	P	C
0	0	2	1

Objective:

The prime aim of this lab is to facilitate students with an opportunity to develop understanding of the basic operations of computer system and computer applications software for solving problems.

- The course will consist of lecture (both theory and practical) in the lab.
- Highlight the mainly practical oriented topics
- Evaluation will be done not on the theory but on the basis of lab programming.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Functioning of Internet, Basic services over Internet like WWW, FTP, Telnet, IP addresses, ISPs, URL, Domain names, Web Browsers, Internet Protocols, Search engines, e-mail. Microsoft word: Introduction, Working with Tables, Finding and replacing text, Mail merge, Creating and Formatting Tables, Formatting of Letters, Quotation, Invoice, Designing the word document with Images and Graphs. Microsoft Excel: Introduction, Add, Subtract, Multiply, Divide in Excel, Excel Data Validation. Microsoft Power Point: Introduction to Power Point, Tool Animation, Templates, Designing Presentations, Slide Show Controls, Printing presentations, Creating Links in Slides, Inserting charts, adding tables, Clipping, Slide animation, Inserting Pictures, Working with tables. MS Word: Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Working with Internet and web browsing	Basic services over Internet i.e. Web browsing, Search engine, Email, Download/ Upload over Internet. Working with Local host. Online Transactions, Google Drive, Google Form.	8
Working with Microsoft Word	Introduction, Creating tables, Inserting picture, document formatting, Use of header and footer page number, Insert foot notes, Use of Shapes, Insert citations, Mail merge, Insertion and Deletion of comments, Language translation, Watermarking, Page setup, Page Preview, Printing a document.	8
Working with Microsoft Excel	Introduction, Working with Spreadsheets: Renaming a Worksheet, The sheet. Adding New Worksheet, Changing the Color of the Worksheet Tabs, Adjusting Columns and Rows: Adjusting Column Width and Row Height, Add/Remove Columns and Rows, Use warp text and merge cells, Setting the Format of a Cell, Formulas: Use of Existing formulas.	8
Working with Microsoft Power Point	Introduction, How to create Slides, Create/ change Templates, Designing Presentations, Slide Show Controls, Customizing Presentations, Auto Content Wizard, Creating Links/hyperlinks in Slides, Inserting Charts, Use of Clip art, Slide Animation and Transection, Inserting Pictures, Working with Tables, Use of Shapes, Header, Footer, Slide number.	8

Syllabus for M.Sc. Agronomy

Course Outcomes

- Understand the importance and basic of internet, web browsing, email, online transactions and skilled on mail drafting along with web browsing.
- Familiar with Microsoft word including document formatting, insert citations, language translation with page setup and printing a documents.
- Skilled on Worksheet and different formulas for sheet along with working charts and printing of spread sheet.
- Student will be able to understand the importance of designing presentation, slide animation, inserting picture with the use of header & footer.

Syllabus for M.Sc. Agronomy

Course Title: PROFESSIONAL PROFICIENCY
(M.Sc. Ag)- I

Course Code: PTSPMMG10T

Semester: I

L	T	P	C
4	0	0	4

Objective:

Students should be able to read and write correct English, attain reasonable fluency in the Language and should also be exposed to introductory lessons of Aptitude Building.

Course Syllabus (Theory)

Hard skill includes Basic Grammar, Vocabulary, Articles, Tenses, Construction of Sentences and Reading Comprehension etc. Efforts should be made to overcome the initial hesitation of speaking English of students and hence improve their fluency in English. Suggested methods include: Follow only English language in the class, Class should be interactive and students should always be engaged in some kind of conversation, Each student should speak 5 minutes, 3-4 times in 1st semester on topics of his choice selected from Social, Global Warming & Climate Change, Environment & Disaster Management, Agricultural Issues, Agri-Entrepreneurship and Agri-Economics, Dairy, Poultry and Agro-Industries, Agriculture Journalism, Politics, World Affairs and Religion etc. In the above process students should be regulated towards better Vocabulary and Pronunciation. Aptitude building, Quantitative aptitude; Basic Calculations: BODMASS rule, Square and square root, Cube and cube root, Different types of numbers, Divisibility rule, Fraction and comparison of fraction, Number System: Multiples, Factors Remainder, Remainder Theorem, Unit Place, Number formation, Factorial, LCM and HCF Finding and its application, Percentage: Basics of percentage and its calculation, Comparison of percentage, How to use in data interpretation, Venn diagram, Logical reasoning; Coding and decoding, Number Series.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Hard Skills Hard skill includes Basic Grammar, Vocabulary, Articles, Tenses, Construction of Sentences and Reading Comprehension etc.	20
2	Communication Skill Efforts should be made to overcome the initial hesitation of speaking English of students and hence improve their fluency in English. Suggested methods include: <ul style="list-style-type: none"> Follow only English language in the class. Class should be interactive and students should always be engaged in some kind of conversation. Each student should speak 5 minutes, 3-4 times in 1st semester on topics of his choice selected from Social, Global Warming & Climate Change, Environment & Disaster Management, Agricultural issues, Agri- Entrepreneurship and Agri- Economics, Dairy, Poultry and Agro- Industries, Agriculture Journalism, Politics, World Affairs and Religion etc. <p>In the above process students should be regulated towards better Vocabulary and Pronunciation.</p>	18
3	Aptitude Building Quantitative Aptitude <ol style="list-style-type: none"> Basic Calculations: BODMASS rule, Square and square root, Cube and cube root, Different types of numbers, Divisibility rule, Fraction and comparison of fraction. Number System: Multiples, Factors Remainder, Remainder Theorem, Unit Place, Number formation, Factorial, LCM and HCF Finding and its application. Percentage: Basics of percentage and its calculation, Comparison of percentage, How to use in data interpretation, Venn diagram. Logical Reasoning <ol style="list-style-type: none"> Coding and decoding Number Series Number Relation 	10

Course Outcomes

- Better representation of himself/ herself in terms of communication skills, overall personality development and aptitude building required for Government & Non-government jobs.
- This program will help students employable and ready for Seed Company, Fertilizer Company, Agro-Industries/ Dairy & Poultry based Industries /Corporate/ CSR project and other Public and Private Sector, Non -Governmental Organizations (NGOs) jobs.

Syllabus for M.Sc. Agronomy

Course Title: TECHNICAL WRITING AND COMMUNICATION SKILLS LAB

Course Code: PTSPMMG20T

Semester: I

L	T	P	C
0	0	2	1

Objective:

The prominent aim of the course to equipped the students with skills to write dissertations, article, research papers etc. from the agricultural research field and able to communicate and articulate in English language.

- The course will consist of lecture (both theory and practical) in the lab.
- Highlight the mainly practical oriented topics.
- Evaluation will be done only on the basis of lab.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Technical Writing– Various forms of scientific writings– thesis, 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.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Various forms of scientific writings– theses, technical papers, reviews, manuals, etc.	Cover Letter, Review Article, Plagiarism, Structure of Review Article, What makes review articles good, Conclusion.	2
Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion)	First part, Cover page, Description page, Table of contents, List of figures, List of tables. Research reports; Introduction of the topic, Theoretical basis, Implementation of the project, Research results and discussion, Development project reports, List of references, Appendices.	2
Writing of abstracts, summaries, précis, citations etc.	Structured Abstract, Additional Thoughts of Abstract, Titles, Keywords, Conclusions.	2
Commonly used abbreviations in the theses and research communications; illustrations, photographs	ANOVA: Analysis of Variance, CF: Community Forest, DDC: District Development Committee, DoA: Department of Agriculture, FAO: Food and Agricultural Organization, GDP: Gross Domestic Product, GOs: Government Organizations.	2
Drawings with suitable captions: pagination, numbering of tables and illustrations	Table 1, Table 2, Figure 1, Figure 2, Table 3, etc., Descriptive caption, Simple Consecutive Numbering, Section-based Numbering.	2
Writing of numbers and dates in scientific write- ups	Times of Day, Use figures, Spell out in words, Indicate continuing time, Dates; Use figures throughout, Spell out month in words, Continuing date, Sequence of the year.	2
Editing and Proof-reading	Concentration is Key, Paper Printout, Watch Out for Homonyms, Watch Out for Contractions and Apostrophes, Check the Punctuation, Read it Backwards, Get Someone Else to Proof read It.	2
Writing of a review article	Purpose of review papers, Domain-based review papers, Theory based review papers, Method-based review papers, Process and structure for review papers,	2

	Systematic literature review process, Structure of systematic review papers, Conclusion.	
Communication Skills– Grammar (Tenses, parts of speech, clauses, punctuation marks)	Verbal, Written, Present tense, Past tense, Future tense, Verb, Noun, Adjective, Adverb, Pronoun, Preposition, Conjunction, Interjection, Commas, Full-stop, Question marks, Exclamation marks, Colons, Semicolons.	4
Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern; Weak forms in connected speech	Error Analysis, Error Taxonomy, Intralingual, Interlingual, Linguistic Component.	4
Participation in group discussion	Topical Group Discussions, Case-studies, Abstract Group Discussions, Evaluation criteria; Content, Analytical skills, Reasoning skills, Organisation skills, Communication skills, Creativity, Listening skill, Leadership quality, Body language, Group behavior.	4
Facing an interview; presentation of scientific papers	Research, Practice, Dress Well, Be Punctual and Prepared, Wait Actively, First Impression, Don't Stress, Introduce Yourself Professionally. Podium Presentation, Appropriate Conference, Make a Plan, Prepare the Abstract, Content for Slides and Speech, Practice and Time your Speech, Familiarize with the Hall and the Audio-Visual System, Delivering the Presentation.	4

Course Outcomes

- Skilled on writing of theses, research paper and manuals along with the core findings of a study derived from the methods applied to gather and analyze information as a parts of thesis and research communications.
- Student will be skilled on scientific writing of abstract and summary of the research study along with abbreviations which is used in the theses and research communications with photograph.
- Understand the importance of editing and proof reading and skilled on pagination, numbering of tables along with date on scientific write-ups and review articles.
- Skilled on communication with grammatical importance and actively participation in a group discussion, interview along with presentation of scientific research paper.

Recommended Text Books/ Reference Books

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

SYLLABUS

FOR

AGRICULTURAL SCIENCES AND TECHNOLOGY

[M.Sc. Agronomy]

(Second Semester)



PRAYAGRAJ

**FACULTY OF AGRICULTURAL
SCIENCES AND TECHNOLOGY**

Syllabus for M.Sc. Agronomy

Course Title: AGRONOMY OF MAJOR CEREALS
AND PULSES

Course Code: AGPCMG201T

Semester: II

L T P C
2 0 0 2

Objective:

The prominent aim of the course is to explore the knowledge of the student on scientific crop husbandry of cereals along with the pulses crops.

Course Syllabus (Theory)

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 Rabi cereals, Kharif cereal, Rabi pulses, and Kharif pulses.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Rabi Cereals 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 Rabi cereals; Wheat & Barley.	8
2	Kharif cereals 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 Kharif cereals; Paddy, Maize, Sorghum & Pearl millet.	8
3	Rabi pulses 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 Rabi pulses; Chick pea.	8
4	Kharif pulses 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 Kharif pulses; Pigeon pea.	8

Course Outcomes

- Understand the importance of rabi cereals crops and their climate adaptation, intercultural methods along with its processing and techniques of maximum production.
- Understand the importance of Kharif cereals crops and their climate adaptation, intercultural methods, along with its processing and techniques of maximum production.
- Understand the importance of Rabi pulses crops and their climate adaptation, intercultural methods, along with its processing and techniques of maximum production.
- Understand the importance of Kharif pulses crops and their climate adaptation, intercultural methods, along with its processing and techniques of maximum production.

Recommended Text Books/ Reference Books

- Introduction to Crops of India- Das NR. 2007. Scientific Publ.
- Science of Field Crop Production- Hunsigi G & Krishna KR. 1998. Oxford & IBH.
- Advances in Pulse Production Technology- Jeswani LM & Baldev B. 1997. ICAR.
- Fundamentals of Cereal Crop Production- Pal M, Deka J & Rai RK. 1996. Tata McGraw Hill.
- Modern Techniques of Raising Field Crops- Singh C, Singh P & Singh R. 2003. Oxford & IBH.
- Crop Management- Singh, SS. 1998. Kalyani Publishers.
- Text Book of Field Crop Production- Prasad, Rajendra. 2002. ICAR.
- Pulse Crops- Yadav DS. 1992. Kalyani Publishers.

Syllabus for M.Sc. Agronomy

Course Title: AGRONOMY OF MAJOR CEREALS AND PULSES LAB

Course Code: AGPCMG201P

Semester: II

L	T	P	C
0	0	2	1

Objective:

The prime aim of this lab is to practically enhance the knowledge of student on cultivating and raising of different cereals and pulses crops with suitable agro-climate.

- The course will consists of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing

Course Syllabus (Practical)

Phenological studies at different growth stages of crop, Estimation of crop yield on the basis of yield attributes, Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities, Working out growth indices (CER, CGR, RGR, NAR, LAD), aggressiveness, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems of different crops, Estimation of protein content in pulses, Planning and layout of field experiments, Judging of physiological maturity in different crops, Intercultural operations in different crops, Determination of cost of cultivation of different crops, Working out harvest index of various crops, Study of seed production techniques in various crops, Visit of field experiments on cultural, fertilizer, weed control and water management aspects, Visit to nearby villages for identification of constraints in crop production.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Phenological studies at different growth stages of crop	Emergence, 3-leaf stage, 5-leaf stage, Panicle initiation stage, Flag leaf (final leaf), Boot stage, 50% flowering, Soft dough stage, Hard dough stage, Physiological maturity.	2
Estimation of crop yield on the basis of yield attributes	Head or Pod number per metre square, Number of grains, 10 heads or pods, Calculate average number of grains per head or pod, Yield in t/ha.	2
Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities	Cropping scheme Importance, Utility, Principles of preparation.	2
Working out growth indices (CER, CGR, RGR, NAR, LAD), aggressiveness, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems of different crops	Leaf Area, Leaf Area Index (LAI), Leaf Area Ratio (LAR), Leaf Weight Ratio (LWR), Leaf Area Duration (LAD), Specific Leaf Area (SLA), Specific Leaf Weight (SLW), Absolute Growth Rate (AGR), Net Assimilation Rate (NAR), Relative Growth Rate (RGR), Crop Growth Rate (CGR), Total dry matter production (TDMP).	2
Estimation of protein content in pulses	Kjeldahl method, Enhanced Dumas method, Methods using UV-visible spectroscopy, Other Instrumental Techniques, Comparison of methods.	2
Planning and layout of field experiments	Selection of experimental units, Fixing of treatments, Arrangement of treatments in the experimental Units; Replication, Randomization, Local control, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), Row trial.	2

Syllabus for M.Sc. Agronomy

Judging of physiological maturity in different crops	Precautions, Procedure, Cereals, Sorghum and minor millets, Pulse crops and legumes.	2
Intercultural operations in different crops	Weeding, Hoeing, Topping, Nipping of buds, Pruning, Shading and earthing up, Weeding and Ploughing etc.	2
Determination of cost of cultivation of different crops	Cost of variable Resources; Seed cost, Fertilizers cost, Plant protection cost, Labour cost, Bullock/Tractor cost, Total Variable cost, Fixed Cost, Cost of Cultivation, Total Income, Net Return, Benefit Cost Ratio.	2

Working out harvest index of various crops	Biological yield, Grain yield and harvest index.	2
Study of seed production techniques in various crops	Selection of Soil, Raising of Seedlings, Direct Sowing of Seeds, Preparation of Land and Transplanting of Seedlings, Isolation Requirement, Management of Annuals, Rogueing.	4
Visit of field experiments on cultural, fertilizer, weed control and water management aspects	As per schedule field visit will be planned on different aspects of field experiments.	4
Visit to nearby villages for identification of constraints in crop production	As per schedule local village visit will be planned on diverse constraints in crop production.	4

Course Outcomes

- Skilled on phenology at different growth stages of crop with estimation of yield on the basis of yield attributes along with formulation of cropping scheme.
- Skilled on growth indices and prominent intercropping system of different crops with estimation of protein in pulses crops.
- Student will be skilled on layout of field experiments, judging of physiological maturity and intercultural operations in different crops.
- Student will be able to determine the cost of cultivation, harvest index and skilled on seed production techniques in various crops.

Syllabus for M.Sc. Agronomy

Course Title: AGRONOMY OF OILSEED, FIBRE
AND SUGAR CROP

Course Code: AGPCMG202T

Semester: II

L	T	P	C
2	0	0	2

Objective

The prime aim of the course is to acquaint the knowledge of the student on scientific crop husbandry of oilseed along with the fiber and sugar crops.

Course Syllabus (Theory)

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of Rabi oilseeds– Rapeseed and mustard, linseed, etc, Kharif oilseeds- Groundnut, sesame, castor, sunflower, soybean etc., Fiber crops- Cotton, jute, sunhemp etc., Sugar crops– Sugar-beet and sugarcane.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Rabi oilseeds Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of Rabi oilseeds– Rapeseed, Mustard, Linseed, etc.	8
2	Kharif oilseeds Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of Kharif oilseeds- Groundnut, Sesame, Castor, Sunflower, Soybean etc.	8
3	Fiber crops Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of Fiber crops- Cotton, Jute, Sunhemp etc.	8
4	Sugar crops Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of Sugar crops– Sugar-beet and Sugarcane.	8

Course Outcomes

- Study the history and agronomic practices with nutritional quality of rabi oilseeds crops along with post-harvest processing of crops.
- Study the history and agronomic practices with nutritional quality of Kharif oilseeds crops along with post-harvest processing of crops.
- Study the history and agronomic practices with nutritional quality of fibre crops along with post-harvest processing of crops.
- Study the history and agronomic practices with nutritional quality of sugar crops along with post-harvest processing of crops.

Recommended Text Books / Reference Books

- Introduction to Crops of India- Das NR. 2007. Scientific Publ.
- Oilseed Crops of India- Das PC. 1997. Kalyani Publishers.
- Technology in Sugarcane Growing- Lakshmikantam N. 1983. 2nd Ed. Oxford & IBH.
- Text Book of Field Crop Production- Prasad, Rajendra. 2002. ICAR.
- Modern Techniques of Raising Field Crops- Singh C, Singh P & Singh R. 2003. Oxford & IBH.
- Crop Management- Singh SS. 1998. Kalyani Publishers.

Syllabus for M.Sc. Agronomy

Course Title: AGRONOMY OF OILSEED, FIBRE
AND SUGAR CROP LAB

Course Code: AGPCMG202P

Semester: II **L T P C**
0 0 2 1

Objective:

The major aim of this lab is to practically enhance the knowledge of student on cultivating and raising of different oilseed, fibre, sugar crops along with suitable agro-climate.

- The course will consists of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Planning and layout of field experiments, Cutting of sugarcane setts, its treatment and methods of sowing, tying and propping of sugarcane, Determination of cane maturity and calculation on purity percentage, recovery percentage and sucrose content in cane juice phenological studies at different growth stages of crop, Intercultural operations in different crops, Cotton seed treatment, Working out growth indices (LER, CGR, RGR, NAR, LAD) aggressivity, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems, Judging of physiological maturity in different crops and working out harvest index, Working out cost of cultivation of different crops, Estimation of crop yield on the basis of yield attributes, Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities, Determination of oil content in oilseeds and computation of oil yield, Estimation of quality of fibre of different fibre crops, Study of seed production techniques in various crops, Visit of field experiments on cultural, fertilizer, weed control and water management aspects, Visit to nearby villages for identification of constraints in crop production.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Planning and layout of field experiments	Selection of experimental units, Fixing of treatments, Arrangement of treatments in the experimental Units; Replication, Randomization, Local control, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), Row trial.	2
Cutting of sugarcane setts, its treatment and methods of sowing, tying and propping of sugarcane	Seeding technologies– Seed rate, Distance, Depth, Plant population, Chlorpyrifos, Sett treatment, Planting on Flat beds, Ridge and furrow method, Trench method, Ring Pit planting, Tissue Culture Technique.	2
Determination of cane maturity and calculation on purity percentage, recovery percentage and sucrose content in cane juice phenological studies at different growth stages of crop	Hand Refractometer brix survey, (Sucrose %/HR Brix) 100, Sugar Recovery (%) = $[S - 0.4 (B - S)] \times 0.73$, Cane yield, Germination, Tillering (formative), Grand growth phase and maturity phase.	2
Intercultural operations in different crops	Weeding, Hoeing, Topping, Nipping of buds, Pruning, Shading and earthing up, Weeding and Ploughing etc.	2
Cotton seed treatment	Delinting, Methods of delinting, Merits of acid delinting, Demerits of acid delinting, Merits of mechanical delinting, Demerits of mechanical delinting, Precautions, Materials Required, Acid delinting, Cowdung slurry method.	2

Syllabus for M.Sc. Agronomy

Working out growth indices (LER, CGR, RGR, NAR, LAD) aggressivity, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems	Leaf Area, Leaf Area Index (LAI), Leaf Area Ratio (LAR), Leaf Weight Ratio (LWR), Leaf Area Duration (LAD), Specific Leaf Area (SLA), Specific Leaf Weight (SLW), Absolute Growth Rate (AGR), Net Assimilation Rate (NAR), Relative Growth Rate (RGR), Crop Growth Rate (CGR), Total dry matter production (TDMP).	2
Judging of physiological maturity in different crops and working out harvest index	Precautions, Procedure, Legumes, Groundnut, Sesame, Cotton.	2
Working out cost of cultivation of different crops	Cost of variable Resources; Seed cost, Fertilizers cost, Plant protection cost, Labour cost, Bullock/Tractor cost, Total Variable cost, Fixed Cost, Cost of Cultivation, Total Income, Net Return, Benefit Cost Ratio.	2
Estimation of crop yield on the basis of yield attributes	Precautions, Procedure, Single plant yield, Yield per unit area, Observations, Single plant yield, Yield per unit area, Calculations.	2
Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities	Cropping scheme Importance, Utility, Principles of preparation.	2
Determination of oil content in oilseeds and computation of oil yield	Soxhlet-based extraction method, Organic solvents.	2
Estimation of quality of fibre of different fibre crops	Mechanical process/ ginning, Ring spinning Method.	2
Study of seed production techniques in various crops	Selection of Soil, Raising of Seedlings, Direct Sowing of Seeds, Preparation of Land and Transplanting of Seedlings, Isolation Requirement, Management of Annuals, Rogueing.	2
Visit of field experiments on cultural, fertilizer, weed control and water management aspects	As per schedule field visit will be planned on different aspects of field experiments.	2
Visit to nearby villages for identification of constraints in crop production	As per schedule local village visit will be planned on diverse constraints in crop production.	4

Course Outcomes

- Student will be skilled on layout of field and to make of different cutting of sugarcane setts with scientific agronomic practices.
- Skilled on determination of cane maturity and seed treatment of cotton with intercultural operations of different crops.
- Skilled on growth indices, physiological maturity and cost of cultivation of different crops along with crop yield and yield attribute.
- Student will be skilled on cropping scheme, oil content in oilseeds crops with quality of fibre in different fibre crops.
- Student will be skilled on seed production techniques of different crops and understand the major constraints of crop production through excursion visit of field experiment.

Syllabus for M.Sc. Agronomy

Course Title: AGRONOMY OF MEDICINAL,
AROMATIC AND UNDER-UTILIZED
CROPS

Course Code: AGPCMG203T

Semester: II

L	T	P	C
2	0	0	2

Objective:

To acquaint students about different medicinal, aromatic and underutilized field crops, their package of practices and processing.

Course Syllabus (Theory)

Importance of medicinal and aromatic plants in human health, national economy and related industries, classification of medicinal and aromatic plants according to botanical characteristics and uses. Climate and soil requirements; cultural practices; yield and important constituents of medicinal plants (Isabgol, Rauwolfia, Poppy, Aloe vera, Satavar, Stevia, Safed Musli, Kalmegh, Asaphoetida, Nux vomica, Rosadle etc). Climate and soil requirements; cultural practices; yield and important constituents of aromatic plants (Citronella, Palmarosa, Mentha, Basil, Lemon grass, Rose, Patchouli, Geranium etc.). Climate and soil requirements; cultural practices; yield of under-utilized crops (Rice bean, Lathyrus, Sesbania, Clusterbean, French bean, Fenugreek, Grain Amaranth, Coffee, Tea and Tobacco).

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Importance and Classification of MAPs Importance of medicinal and aromatic plants in human health, national economy and related industries, classification of medicinal and aromatic plants according to botanical characteristics and uses.	8
2	Climate and Yield of Medicinal plants Climate and soil requirements; cultural practices; yield and important constituents of medicinal plants (Isabgol, Rauwolfia, Poppy, Aloe vera, Satavar, Stevia, Safed Musli, Kalmegh, Asaphoetida, Nux vomica, Rosadle etc).	8
3	Climate and Yield of Aromatic plants Climate and soil requirements; cultural practices; yield and important constituents of aromatic plants (Citronella, Palmarosa, Mentha, Basil, Lemon grass, Rose, Patchouli, Geranium etc.).	8
4	Climate and Yield of under-utilized crops Climate and soil requirements; cultural practices; yield of under-utilized crops (Rice bean, Lathyrus, Sesbania, Clusterbean, French bean, Fenugreek, Grain Amaranth, Coffee, Tea and Tobacco).	8

Course Outcomes

- Understand the importance of medicinal & aromatic plant with underutilized filed crops and its classification.
- Study the agro-climate, cultural practices and yield of crops with addition of its valuable different constituents and quality of medicinal crops.
- Study the agro-climate, cultural practices and yield of crops with addition of its valuable different constituents and quality of aromatic crops.
- Study the agro-climate, soil requirement and cultural practices of crops along with yield of underutilized crops.

Recommended Text Books / Reference Books

- Cultivation and Utilization of Medicinal Plants- Handa SS. 1984. RRL, CSIR, Jammu.
- Introduction to Crops of India- Das NR. 2007. Scientific Publ.
- Advances in Horticulture- Chadha KL & Gupta R. 1995. Vol. II. Medicinal and Aromatic.
- Essential Oil Plants and their Cultivation- Hussain A. 1984. CIMAP, Lucknow.
- Hand Book of Agriculture- ICAR 2006. ICAR, New Delhi.
- Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants- Kumar N, Khader Md. Abdul, Rangaswami JBM & Irulappan 1997. Oxford & IBH.
- A Hand Book of Medicinal Plants: A Complete Source Book- Prajapati ND, Purohit SS, Sharma AK & Kumar T. 2003. Agrobios.
- Agro-Techniques of Medicinal Plants- Sharma R. 2004. Daya Publ. House.

Syllabus for M.Sc. Agronomy

Course Title: AGRONOMY OF MEDICINAL,
AROMATIC AND UNDER-UTILIZED
CROPS LAB

Course Code: AGPCMG203P

Semester: II

L	T	P	C
0	0	2	1

Objective:

The prominent aim of this lab is to practically explore the knowledge on cultivation of valuable and curable MAP and underutilized crop under field condition as alternatives to some of the traditional uneconomic crops.

- The course will consist of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Identification of crops based on morphological and seed characteristics, Raising of herbarium of medicinal, aromatic and under-utilized plants, Quality characters in medicinal and aromatic plants, Methods of analysis of essential oil and other chemicals of importance in medicinal and aromatic.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Identification of crops based on morphological and seed characteristics	Flat and kidney shaped, Rounded shaped, oval-shaped, Seed coat, Size, Shape, Surface, Colour, Hilum.	4
Raising of herbarium of medicinal plants	Collection of specimens, Preservation of Specimens, Storage of specimens, Common name, Botanical name, Parts use, Medicinal use.	4
Raising of herbarium of aromatic plants	Collection of specimens, Preservation of Specimens, Storage of specimens, Common name, Botanical name, Parts use, Aromatic use.	4
Raising of herbarium of under- utilized plants	Collection of specimens, Preservation of Specimens, Storage of specimens, Common name, Botanical name, Parts use, Under-utilized plants.	4
Quality characters in medicinal and aromatic plants	Good collection practices (GCP), Good agricultural practice (GAP), Good laboratory practices (GLP), Good manufacturing practices (GMP).	4
Methods of analysis of essential oil	Gas chromatographic analyses, GC-MS analyses	6
Methods of analysis of other chemicals and its importance in medicinal and aromatic plants	GC and GC-MS analyses	6

Course Outcomes

- Skilled on identification of plant through morphology and seed characteristics along with raising of medicinal plant herbarium.
- Skilled on raising herbarium of different aromatic and underutilized plants along with quality character of medicinal and aromatic plants.
- Student will be skilled on analysis of essential oil and other chemical constituent along with its importance in medicinal and aromatic plants.

Syllabus for M.Sc. Agronomy

Course Title: AGROMETEOROLOGY AND CROP WEATHER FORECASTING

Course Code: AGPCMG204T

Semester: II

L	T	P	C
2	0	0	2

Objective:

To impart knowledge about agro-meteorology and crop weather forecasting to meet the challenges of aberrant weather conditions.

Course Syllabus (Theory)

Agro meteorology- aim, scope and development in relation to crop environment; composition of atmosphere, distribution of atmospheric pressure and wind. Characteristics of solar radiation; energy balance of atmosphere system; radiation distribution in plant canopies, radiation utilization by field crops; photosynthesis and efficiency of radiation utilization by field crops; energy budget of plant canopies; environmental temperature: soil, air and canopy temperature. Temperature profile in air, soil, crop canopies; soil and air temperature effects on plant processes; environmental moisture and evaporation: measures of atmospheric temperature and relative humidity vapor pressure and their relationships; evapotranspiration and meteorological factors determining evapotranspiration. Modification of plant environment: artificial rain making, heat transfer, controlling heat load, heat trapping and shading; protection from cold, sensible and latent heat flux, controlling soil moisture; monsoon and their origin, characteristics of monsoon; onset, progress and withdrawal of monsoon; weather hazards, drought monitoring and planning for mitigation. Weather forecasting in India– short, medium and long range; aerospace science and weather forecasting; benefits of weather services to agriculture, remote sensing; application in agriculture and its present status in India; atmospheric pollution and its effect on climate and crop production; climate change and its impact on agriculture.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	<p>Solar radiation</p> <p>Agro meteorology- aim, scope and development in relation to crop environment; composition of atmosphere, distribution of atmospheric pressure and wind. Characteristics of solar radiation; energy balance of atmosphere system; radiation distribution in plant canopies, radiation utilization by field crops; photosynthesis and efficiency of radiation utilization by field crops; energy budget of plant canopies; environmental temperature: soil, air and canopy temperature.</p>	8
2	<p>Atmospheric temperature</p> <p>Temperature profile in air, soil, crop canopies; soil and air temperature effects on plant processes; environmental moisture and evaporation: measures of atmospheric temperature and relative humidity vapor pressure and their relationships; evapotranspiration and meteorological factors determining evapotranspiration.</p>	8
3	<p>Plant Environment</p> <p>Modification of plant environment: artificial rain making, heat transfer, controlling heat load, heat trapping and shading; protection from cold, sensible and latent heat flux, controlling soil moisture; monsoon and their origin, characteristics of monsoon; onset, progress and withdrawal of monsoon; weather hazards, drought monitoring, planning for mitigation.</p>	8
4	<p>Weather forecasting</p> <p>Weather forecasting in India– short, medium and long range; aerospace science and weather forecasting; benefits of weather services to agriculture, remote sensing; application in agriculture and its present status in India; atmospheric pollution and its effect on climate and crop production; climate change and its impact on agriculture.</p>	8

Course Outcomes

- Study the agrometeorology and its scope with solar radiation, photosynthesis of field crops along with environmental and plant canopy temperature.
- Understand the temperature profile in air, soil, crop canopies and relative humidity along with evapotranspiration and meteorological factors determining evapotranspiration.
- Understand the plant environment including heat trapping, latent heat flux, characteristics of monsoon and planning for mitigation of environment.
- Student will be able to find out the weather forecasting including short, medium and long range with benefits of weather services & application to agriculture.

Recommended Text Books/ Reference Books

- Introduction to Agro-meteorology- Mavi H.S.1994. Oxford & IBH.
- Agrometeorology: Principles and Application of Climate Studies in Agriculture- Mavi HS & Tupper GJ. 2004. Haworth Press.
- Practical Manual on Agricultural Meteorology- Variraju R & Krishnamurty 1995. Kalyani Publishers.
- Climate and Agriculture on Ecological Survey- Chang Jan Hu 1968. Aldine Publ.
- General Climatology- Critchfield HJ.1995. Prentice Hall of India
- Agrometeorology and Remote Sensing: Principles and Practices- Sahu DD. Agrobios.
- The Monsoons- Das PK.1968. National Book Trust Publ.
- Climatology- Lal DS.2005. Sharda Pustak Bhawan
- Climate, Weather and Crops in India- Lenka D.1998. Kalyani Publishers.
- Textbook of Agricultural Meteorology- Varshneya MC & Balakrishana Pillai P. 2003. ICAR.

Syllabus for M.Sc. Agronomy

Course Title: AGROMETEOROLOGY AND CROP
WEATHER FORECASTING LAB

Course Code: AGPCMG204P

Semester: II

L	T	P	C
0	0	2	1

Objective:

The prime aim of this lab is to technically sound the students on use of weather and climate information to enhance or expand agricultural crops along with increase crop production.

- The course will consists of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Visit to agro-meteorological observatory and to record sun-shine hours, wind velocity, wind direction, relative humidity, soil and air temperature, evaporation, precipitation and atmospheric pressure, Measurement of solar radiation outside and within plant canopy, Measurement/estimation of evapo-transpiration by various methods, Measurement/ estimation of soil water balance, Rainfall variability analysis, Determination of heat-unit requirement for different crops, Measurement of crop canopy temperature, Measurement of soil temperatures at different depths, Remote sensing and familiarization with agro-advisory service bulletins, Study of synoptic charts and weather reports, working principle of automatic weather station, Visit to solar observatory.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Visit to agro- meteorological observatory and to record sun-shine hours, wind velocity, wind direction, relative humidity, soil and air temperature, evaporation, precipitation and atmospheric pressure	As per schedule agro-meteorological observatory visit will be planned on different aspects of experiments. Introduction, Procedure, Observation, Conclusions.	4
Measurement of solar radiation outside and within plant canopy	Short wave radiation/ global radiation, Horizontal surface, Pyranometers, Angstroms formula, Station, Latitude °N, Month.	2
Measurement/estimation of evapo-transpiration by various methods	Lysimeters, Gravimetric lysimeter, Volumetric lysimeter, Mini-lysimeter, Drum culture technique.	2
Measurement/estimation of soil water balance	Soil water balance model.	2
Rainfall variability analysis	Meteorological stations, Raingauges stationed, Nonparametric modified Mann-Kendal (MK) and Levene tests.	2
Determination of heat-unit requirement for different crops	Maximum temperature (°C), Minimum temperature (°C), Base temperature (°C).	2
Measurement of crop canopy temperature	Infrared thermometer (IRT), Canopies, Long-wave infrared radiation, Temperature, Electrical signal, Thermometer.	2
Measurement of soil temperatures at different depths	Soil thermometers, Iron stands, Particular depth of the soil, Reading of the scale, 0.1°C soil temperatures, 0700 hrs and 1400 hrs LMT, 5,15 and 30 cm depths, Procedure, Observation.	4

Remote sensing and familiarization with agro-advisory service bulletins	Remote sensing techniques, Agrometeorological service, Agriculture (crops), Forestry and vegetation mapping, Water resources, Extended Range Forecast System, Rainfall forecast maps, Extended Range Rainfall Forecast, Week 1, Week 2, Tmax (Maximum Temperature), Tmin (Minimum Temperature).	4
Study of synoptic charts and weather reports, working principle of automatic weather station	Circular lines, Isobars, Barometric pressure, Cold fronts, Warm fronts, Synoptic chart, Lines, Triangles and semi-circles, Occluded fronts, Troughs.	2
Visit to solar observatory	As per schedule solar observatory visit will be planned.	2
Visit to agro meteorological observatory and to record sun-shine hours, wind velocity, wind direction, relative humidity, soil and air temperature, evaporation, precipitation and atmospheric pressure	As per schedule agro-meteorological observatory visit will be planned on different aspects of experiments. Introduction, Procedure, Observation, Conclusions.	4

Course Outcomes

- Skilled on recording of data on sun-shine hours, wind velocity, wind direction, relative humidity, soil and air temperature.
- Skilled on measurement and estimation of solar radiation, evapo-transpiration by various methods and soil water balance along with analysis of rainfall.
- Understand the heat-unit requirement of different crops with measurement of canopy temperature.
- Skilled on measurement of soil temperature, remote sensing and agro-advisory service bulletins along with weather report.

Syllabus for M.Sc. Agronomy

Course Title: SOIL FERTILITY AND PLANT NUTRITION

Course Code: AGPCMG205T

Semester: II

L	T	P	C
2	0	0	2

Objective:

The aim of the study is to explore the knowledge of different types of fertilizers, manures, essential plant nutrients and available form of nutrients in sustain growth of plant along with curative approaches for sustainability of soil fertility.

Course Syllabus (Theory)

Forms of macro and micro nutrients in soils. Availability of macro and micronutrients in soils. Mobility of macro and micronutrients in soils. Losses of macro and micronutrients in soils. Nutrient deficiencies in soil. Nutrient toxicities in soil. Recent diagnostic techniques of nutrient toxicity. Recent ameliorative measures of nutrient toxicity. Nutrients and nutrient– water interactions. Balanced use of nutrients. Integrated plant nutrient supply. Integrated plant nutrient management. Nutrient uptake mechanisms. Nutrient release and carry over effects. Quantity intensity relationships. Soil fertility evaluation. Soil test crop response. Correlations and response functions soil test crop. Essential plant nutrients. Criteria for essentiality of plant nutrients. Soil pH and availability of nutrients. Soil fertility. Soil fertility- concept and evaluation. Ion absorption. Role of plant roots and foliar parts. Mechanism of movement of nutrients in soil. Mechanism of movement of nutrients to plant. Deficiency symptoms of plant nutrients. Diagnostic techniques of nutrient deficiency. Nutrient toxicities. Nutrients release effects. Nutrients carry over effects. Nutrient uptake mechanism.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Macro and Micro nutrients Forms of macro and micro nutrients in soils. Availability of macro and micronutrients in soils. Mobility of macro and micronutrients in soils. Losses of macro and micronutrients in soils. Nutrient deficiencies in soil. Nutrient toxicities in soil. Recent diagnostic techniques of nutrient toxicity. Recent ameliorative measures of nutrient toxicity.	8
2	Nutrients and nutrient Nutrients and nutrient– water interactions. Balanced use of nutrients. Integrated plant nutrient supply. Integrated plant nutrient management. Nutrient uptake mechanisms. Nutrient release and carry over effects. Quantity intensity relationships. Soil fertility evaluation.	8
3	Criteria for plant nutrients and Soil fertility Soil test crop response. Correlations and response functions soil test crop. Essential plant nutrients. Criteria for essentiality of plant nutrients. Soil pH and availability of nutrients. Soil fertility. Soil fertility- concept and evaluation. Ion absorption.	8
4	Nutrient deficiency Role of plant roots and foliar parts. Mechanism of movement of nutrients in soil. Mechanism of movement of nutrients to plant. Deficiency symptoms of plant nutrients. Diagnostic techniques of nutrient deficiency. Nutrient toxicities. Nutrients release effects. Nutrients carry over effects. Nutrient uptake mechanism.	8

Course Outcomes

- Student will be able to understand the forms of macro and micro nutrient in soil and nutrient deficiencies in soil.
- Understand the nutrient uptake mechanism and integrated nutrient management of crop.
- Understand the essential plant nutrients and its criteria for essentiality along with soil fertility.
- Student will be able to understand the mechanism of nutrient movement, nutrient deficiency & toxicities with nutrient uptake mechanism.
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Syllabus for M.Sc. Agronomy

Recommended Text Books/ Reference Books

- Soil nutrient bioavailability- Barber, S. A. 1984. John Wiley, New York, pp389.
- The control of soil fertility- Cooke, G. W. 1967. Crossby Lockwood and Sons, London, pp. 526.
- Mineral Nutrition of Plants- Principles and Perspectives- Epstein, E. 1978. Wiley Eastern New Delhi, pp.412.
- Principles of Plant Nutrition- Mengel, K. and Kirkby, E. A 1987. International Potash Institute Switzerland, pp 687.
- Micronutrients in Agriculture- Mortvedt, J. Shuman, L. M., Cox, F. R. and Weich, R. M. (ed) 1991. Soil Science Society of America, pp 760.

Syllabus for M.Sc. Agronomy

Course Title: SOIL FERTILITY AND PLANT NUTRITION LAB

Course Code: AGPCMG205P

Semester: II

L	T	P	C
0	0	2	1

Objective:

The prominent aim of this lab is to practically explore the knowledge to measure the all the essential plant nutrients, their role in plant growth, behavior in soil, and scientific management of plant nutrients.

- The course will consists of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Estimation of N in soil and their critical value in soils. Estimation of P in soil and their critical value in soils. Estimation of K in soil and their critical value in soils. Estimation of N in plant samples and their critical value in plants. Estimation of P in plant samples and their critical value in plants. Estimation of K in plant samples and their critical in plants. Determination of different pools of macro and micronutrients. Quantity- intensity relations of P and K. Estimation of S in soil. Estimation of Zn in soil. Estimation of B in soil. Estimation of Cu in soil. Estimation of S and Zn in plants. Estimation of B and Cu in plants. Qualitative and quantitative estimation of soil nutrients (N, P and K) in Fertilizers. Fertilizer analysis and quality control.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Estimation of N in soil and their critical value in soils	Kjeldahl,s method, Digestion, Distillation, Titration, KEL PLUS Automatic nitrogen Estimation system, Reagents, Sulphuric acid (H ₂ SO ₄), Potassium sulphate, Cupric sulphate, Selenium powder, Sodium hydroxide, Sulphuric acid, Soil sample, Calculation, Crude protein content, Nitrogen content in soil (%)	2
Estimation of P in soil and their critical value in soils	0.5 M Sodium bicarbonate Solution, Activated charcoal, 5 N Sulphuric acid, Reagent A, Reagent B, Standard phosphate solution, Preparation of standard curve, Soil sample, Whatman No. 40 paper, 5ml aliquot, Distilled water, Blue colour.	2
Estimation of K in soil and their critical value in soils	Flame photometer with red filter, Pipette, Volumetric flask and conical flask (100 ml), Reagent; Neutral Normal Ammonium acetate, Standard Potassium solution, Preparation of standard curve, Procedure; 5gm soil, NH ₄ OAc solution, Whatman no1 filter paper.	2
Estimation of N in plant samples and their critical value in plants	Kjeldahl,s method, Digestion, Distillation, titration, KEL PLUS Automatic nitrogen Estimation system, Reagents, Sulphuric acid (H ₂ SO ₄), Potassium sulphate, Cupric sulphate, Selenium powder, Sodium hydroxide, Sulphuric acid, Soil sample, Calculation, Crude protein content, Nitrogen content in plant (%).	2
Estimation of P in plant samples and their critical value in plants	Vanadate and Molybdate, Orthophosphate, Yellow colour, Reagent; Colourimeter/ Spectrophotometer, Ammonium molybdate, Boiling water, 250 ml conc, NHO ₃ , Phosphate standard solution, Digestion of Plant material, Estimation.	2
Estimation of K in plant samples and their critical in plants	1-2 g of ground plant sample,100 ml digestion flask, Acid mixture; conc HNO ₃ , conc. H ₂ SO ₄ , HClO ₄ , Hot plate, Completion of digestion, 20-25 ml H ₂ O, Whatman No.40, Volume flask, Aliquot, Flame photometer, Oven dry matter basis, K (%) in plant sample.	2

Syllabus for M.Sc. Agronomy

Determination of different pools of macro and micronutrients	Lambert's Law, Beers Law, Atomic absorption spectrophotometer; Light source, Atomizer burner assembly, Monochromator, Detector, Photomultiplier, Collection and preparation of soil and plant sample, Soil extraction, Extracting solution, Apparatus required, Soil analysis;	2
Quantity-intensity relations of P and K	Soil samples, Hole auger, pH and electrical conductivity of the soils, 1:2.5 soil/water suspension, Organic carbon, Dichromate oxidation, 1 N ammonium acetate, 1 N nitric acid (HNO ₃), Flame photometry and calcium (Ca) ⁺ and magnesium (Mg), Titration with 0.01 N ethylene diaminetetra acetic acid (EDTA).	2
Estimation of S in soil	Colorimeter or Spectrophotometer, Mechanical shaker, Mono calcium phosphate, Gum acacia acetic solution, Barium chloride, Standard stock solution, Working standard solution, Barium sulphate, Dilute nitric acid, Acetic phosphoric acid, Soil sample, Whatman No.42 filter paper, Available sulphur in soil (Mg Kg ⁻¹).	2
Estimation of Zn in soil	10 g soil sample, 100 ml iodine value flask, 25 ml DTPA solution, TEA 0.1 M (AR or extra pure) solution, CaCl ₂ .2H ₂ O (AR) 0.01 M, Dilute HCl (1:1), Shaker at 70-80 oscillation per minute, Filter, Whatman No.1 filter paper, Atomic absorption spectrophotometer, Procedure, Precautions, Available Zinc.	2
Estimation of B in soil	Azomethin H method, H ₃ BO ₃ in Aqueous media, Spectrophotometer, Polypropylene tubes, Distilled water, Buffer Solution, Ammonium acetate (NH ₄ OAc), EDTA disodium salt, Ascorbic acid solution, Calcium hydroxide suspension Ca (OH) ₂ .	2
Estimation of Cu in soil	Lambert's Law, Beers Law, Atomic absorption spectrophotometer; Light source, Atomizer burner assembly, Monochromator, Detector, Photomultiplier, Collection and preparation of soil and plant sample, Soil extraction, Extracting solution, Apparatus required, Soil analysis; 12.5 g soil, 100 ml iodine, DTPA solution, Cu 3.929 g l ⁻¹ CuSO ₄ , 5H ₂ O, Whatman No.1 filter paper, Hot plate, Shale 2 hour, Distilled water.	2
Estimation of S and Zn in plants	20 g soil sample, 100 ml monocalcium phosphate, Whatman No.42, Shake one hour, 25ml volumetric flask, HNO ₃ , BaSO ₄ , BaCl ₂ , Gum acacia acetic acid, Standard curve, Available sulphur in soil (mg kh ⁻¹), Zn -4.398g, ZnSO ₄ , 7H ₂ O, 12.5 g Soil sample, DTPA solution Shake mixture 2 hour, Filter, Whatman No.1filter paper, Atomic absorption spectrophotometer.	2
Estimation of B and Cu in plants	0.5 g Plant sample, 0.5g Ca (OH) ₂ , Muffle furnace at 550 °C, White grey ash, Distilled water, 5 ml 0.1 N HCl, Volumetric flask, 1ml Aliquot, Standard curve. 0.5 g Plant sample, Conical flask, Di acid mixture (1 Perchloric +4 nitric acid), Hot plate, Colourless residue, Whatman No.1 filter paper, Make up the volume.	2
Qualitative and quantitative estimation of soil nutrients (N, P and K) in Fertilizers	Parameters: Humification index (HI), Humification degree (HD), Humification rate (HR).	2
Fertilizer analysis and quality control	Three primary nutrients– Nitrogen (N), Phosphorous (P), or Potassium (K), Two most important Organic manure and mineral fertilizers. Samples Analysed, %age achievement, Samples found nonstandard, %age of Nonstandard samples.	2

Course Outcomes

- Skilled on estimation of Nitrogen, Phosphorus and Potassium in soil and their critical value in soils.
- Student will be skilled on estimation of N, P, K in plant samples and their critical value in plants.
- Student will be skilled on macro and micronutrient along with estimation of sulphur (S), Zinc (Zn), Boron (B) and Copper (Cu).
- Skilled on estimation of S, Zn, B and Cu in plants along with soil nutrients and fertilizer analysis.

Syllabus for M.Sc. Agronomy

Course Title: PRINCIPLES AND PRACTICES OF
WATER MANAGEMENT

Course Code: AGPCMG206T

Semester: II

L	T	P	C
2	0	0	2

Objective:

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

Course Syllabus (Theory)

Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states. Soil water movement in soil and plants; transpiration; Soil moisture constants; soil water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition. Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; microirrigation system; fertigation; management of water in controlled environments and polyhouses. Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency. 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.

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	Water and its role in plants Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.	8
2	Soil water-plant relationships Soil water movement in soil and plants; transpiration; Soil moisture constants; soil water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition.	8
3	Methods of irrigation 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 polyhouses.	8
4	Water management Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency. 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.	8

Course Outcomes

- Study the water resources, major irrigation projects and crops irrigated in different states of India.
- Understand the soil water-plant relationship including water absorption, water stress and moisture stress condition of soil.
- Understand the methods of irrigation including micro-irrigation, fertigation and water management in problem soils including drainage, requirement of crops.

Recommended Text Books/ Reference Books

- Principles and Practices of Water Management- Panda SC. 2003. Agrobios.
- Irrigation of Food Crops- Principles and Practices- Prihar SS & Sandhu BS. 1987. ICAR.
- Irrigation and Drainage- Lenka D. 1999. Kalyani Publishers.
- Manual on Irrigation Agronomy- Mishra RD & Ahmed M. 1990. Oxford & IBH Publishing Co. Pvt. Ltd.
- Irrigation: Theory and Practice- Michael AM. 1978. Vikas Publishing House.
- Irrigation with Saline Water- Paliwal KV. 1972. IARI Monograph, New Delhi.
- Principles of Crop Production- Reddy SR. 2000. Kalyani Publishers.

Syllabus for M.Sc. Agronomy

Course Title: PRINCIPLES AND PRACTICES OF
WATER MANAGEMENT LAB

Course Code: AGPCMG206P

Semester: II

L	T	P	C
0	0	2	1

Objective:

The prominent aim of this lab is to practically facilitate the knowledge of student on effective and sustainable water resources management with their uses.

- The course will consists of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Measurement of soil moisture by using tensiometer, and pressure plate and membrane apparatus. Soil-moisture characteristics curves. Water flow measurements using different devices. Determination of irrigation requirements. Calculation of irrigation efficiency. Determination of infiltration rate. Determination of saturated/unsaturated hydraulic conductivity.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Measurement of soil moisture by using tensiometer	Construction; porous ceramic cup, water, water filled tube, manometer or vacuum gauge, Installation and method of determination, Limitations, Precautions, Problem.	2
Measurement of soil moisture by using pressure plate and membrane apparatus	Cylinder with compressed air (or Compressor) Reducing valve, Collecting beaker, Numbered rings, Diameter 3 cm, height 1 cm, Small disk, 100 g soil, Preparing pressure extractor, Installing samples, Measurement.	4
Soil-moisture characteristics curves	Four groups; Low suction (0-100 cm water), Medium suction (100-1000 cm water), High suction (1000- 20,000 cm water), Very high suction (20,000- 100,000 cm water).	4
Water flow measurements using different devices	Undisturbed soil core, Glass disc, Buchner funnel, Equilibrate 24 h, Burette reading, Remove core, Initial fresh weight, Dry weight, Observation, Precautions.	4
Determination of irrigation requirements	Net irrigation requirement (NIR), Gross irrigation requirement (GIR), Gross irrigation requirement (in field), Irrigation frequency, Irrigation period.	4
Calculation of irrigation efficiency	Water conveyance efficiency, Water application efficiency, Water storage efficiency, Water distribution efficiency, Water use efficiency; Crop water use efficiency, Field water use efficiency, Project efficiency, Economic (irrigation) efficiency, Significance of irrigation efficiencies.	4
Determination of infiltration rate	Galvanized iron cylinders 40 cm and 30 cm in diameter, Soil depth of about 10-15 cm, Cap and tap the soil, Soil column, cylinder, Inner ring, Outer ring, Buffer pond, Record recession in water level, time. Observations.	4
Determination of saturated/ unsaturated hydraulic conductivity	Hydraulic laboratory methods, Hydraulic fields methods.	4
Measurement of soil moisture by using tensiometer	Construction; porous ceramic cup, water, water filled tube, manometer or vacuum gauge, Installation and method of determination, Limitations, Precautions, Problem.	2

Course Outcomes

- Skilled on measurement of soil moisture and soil moisture characteristics by different tools/ equipment.
- Student will be skilled on water flow measurements and able to determine irrigation requirements with scientific methods.
- Student will be able to calculate irrigation efficiency and skilled on determination of infiltration rate of the soil.

Syllabus for M.Sc. Agronomy

Course Title: MASTER'S RESEARCH
(SYNOPSIS PRESENTATION)

Course Code: AGPCMG207T

Semester: II

L	T	P	C
1	0	0	5

Objective:

The synopsis presentation are explore the basic knowledge of research as a part of M.Sc. (Ag.) degree programme and through the proposed research it would contribute to the scientific approach to make India self- resilient.

Master's Research (Synopsis Presentation)

All of the M.Sc. (Ag) Agronomy students have to prepare synopsis after the discussion of Supervisor with suitable research topic. Synopsis is the gist of your planned project submitted for approval from competent authorities. It gives a panoramic view of your research for quick analysis by the expert/ reviewers. Thus, a synopsis forms an integral part of a M.Sc. (Ag.) Agronomy research project or a thesis. United universities have made it mandatory for the postgraduate students (M.Sc.) to prepare a thesis as a part of their agriculture postgraduate degree programme.

A synopsis should be constructed in a manner that facilitates the reviewer to understand the research project at a glance. It should be brief but precise. A synopsis can be prepared in the following manner.

Title

Introduction

Aims/

Objectives

Review of literature

Materials and Methods

Bibliography/

References Official

requirements

Syllabus for M.Sc. Agronomy

Course Title: PROFESSIONAL PROFICIENCY
(M.Sc. Ag)- II

Course Code: PTSPMMG20T

Semester: II

L	T	P	C
4	0	0	2

Objective:

Students should be able to read and write correct English, attain reasonable fluency in the Language and should also be exposed to introductory lessons of Aptitude Building.

Course Syllabus (Theory)

HARD SKILLS: Hard skill includes Basic Grammar, Vocabulary, Articles, Tenses, Construction of Sentences and Reading Comprehension etc. **COMMUNICATION SKILL:** Efforts should be made to overcome the initial hesitation of speaking English of students and hence improve their fluency in English. Suggested methods include Follow only English language in the class, Class should be interactive and students should always be engaged in some kind of conversation, Each student should speak 10 minutes, 2-5 times in 2nd semester on topics of his choice selected from Social, Global Warming & Climate Change, Environment & Disaster Management, Agriculture Issues, Agri-Entrepreneurship and Agri-Economics, Dairy, Poultry and Agro- Industries, Agriculture Journalism, Politics, World Affairs and Religion etc. In the above process students should be regulated towards better Vocabulary and Pronunciation. **APTITUDE BUILDING: QUANTITATIVE APTITUDE:** Ratio and proportion, Partnership, Problem on Ages. **LOGICAL REASONING:** Inequalities, Direction Test, Syllogism (Basics).

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	HARD SKILLS Hard skill includes Basic Grammar, Vocabulary, Articles, Tenses, Construction of Sentences and Reading Comprehension etc.	10
2	COMMUNICATION SKILL Efforts should be made to overcome the initial hesitation of speaking English of students and hence improve their fluency in English. Suggested methods include: <ul style="list-style-type: none"> Follow only English language in the class. Class should be interactive and students should always be engaged in some kind of conversation. Each student should speak 10 minutes, 2-5 times in 2nd semester on topics of his choice selected from Social, Global Warming & Climate Change, Environment & Disaster Management, Agriculture Issues, Agri-Entrepreneurship and Agri-Economics, Dairy, Poultry and Agro- Industries, Agriculture Journalism, Politics, World Affairs and Religion etc. In the above process students should be regulated towards better Vocabulary and Pronunciation.	25
3	APTITUDE BUILDING QUANTITATIVE APTITUDE <ol style="list-style-type: none"> Ratio and proportion. Partnership. Problem on Ages. LOGICAL REASONING <ol style="list-style-type: none"> Inequalities. Direction Test. Syllogism (Basics). 	10

Course Outcomes

- Better representation of himself/ herself in terms of communication skills, overall personality development and aptitude building required for Government & Non-government jobs.
- This program will help students employable and ready for Seed Company, Fertilizer Company, Agro-Industries/ Dairy & Poultry based Industries /Corporate/ CSR project and other Public and Private Sector, Non-Governmental Organizations (NGOs) jobs.

Syllabus for M.Sc. Agronomy

Course Title: BASIC CONCEPTS IN LABORATORY
TECHNIQUES LAB

Course Code: AGPCMG208P

Semester: II

L	T	P	C
0	0	2	1

Objective:

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

- The course will consists of lecture (both theory and practical) in the lab.
- Illustrate the mainly practical oriented topics.
- Evaluation will be done not on the theory but on the basis of field practical & assignment.
- Aim of study to practically skilled the student on the scale of learning by doing.

Course Syllabus (Practical)

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets; 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; Neutralisation 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, sand-bath, water-bath, oil-bath; 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.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Safety measures while in Lab	General Instruction, Personal Protection, Clothing, and Hair, Cover exposed skin, Tie back long hair, Jewellery, Never eat food, Drink beverages, Chew gum.	2
Handling of chemical substances	Chemical Handling, Chemical Storage, Pressure and Vacuum Systems, Container Handling, Disposal of Chemical Wastes	2
Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets;	The Separatory funnel; extraction techniques, Graduated cylinder; Measuring volume, Micropipettes; Automatic pipette, Glass pipette, Pipette parts, Proper use.	2
Washing, drying and sterilization of glassware	Special rinsing cycle, Automatic dryer (below 100 °C), Water-miscible organic solvent, Stream of air or nitrogen, Decontaminate, Disinfectant, Test to check the cleaning, Cleaning Basics Steps.	2
Drying of solvents/chemicals	Alcohol; Anhydrous Potassium carbonate, Anhydrous Magnesium, Aldehydes; Anhydrous sodium sulphate, Anhydrous Magnesium, Organic acids; Anhydrous sodium sulphate.	2
Weighing and preparation of solutions of different strengths and their dilution	Solutions, Standard solution, Saturated solution, Supersaturated solution, Preparing solution, Weight measurement, Basic Protocol-1, Basic Protocol-2, Volume measurement, Measuring chemicals, Procedure for preparing a solution.	2
Handling techniques of solutions	Personal Protective Equipment, Wear chemically-rated gloves, Chemical resistant apron, Face shield, HF acid solutions: Teflon or high density polyethylene, Sulfuric acid solutions including piranha: pyrex or quartz, Photoresist developer solutions: pyrex, Photoresist stripper solutions: pyrex.	2
Preparation of different agro- chemical doses in field and pot applications	Agrochemicals; Pesticides, Synthetic fertilizers, Growth regulators; Different pesticides doses, Different fungicides doses, Different nematicide doses, Disease control, Weedicide dose, Application.	2

Syllabus for M.Sc. Agronomy

Preparation of solutions of acids; Neutralisation of acid and bases	Molarity, Percent Solutions, Acid, Base, Alkalinity of the solution, Acidity of the solution, Neutral (pH 7).	2
Preparation of buffers of different strengths and pH values	Weak acid, Conjugate base, Weak base, Conjugate acid, Strong acid (more H ⁺), Constant value, Preparing a Buffer Solution.	2
Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand- bath, water-bath, oil-bath; Electric wiring and earthing	Structural components, Optical components; Eye piece/ocular, Objective lens, Stage, Condenser, Working, Setting three eyepieces- 5x, 10x, and oil- immersion, Method, Biosafety Cabinets, Type-A, Type-B, Type-C ¹ , PCR stations, Minimize clutter, Hands wash, Arrange objects, HEPA/ULPA filter, Remove outer pouches.	2
Preparation of media and methods of sterilization	Stir and boil, Agar medium, Autoclave, Plate production, Sterile petri dishes, Wet Heat (Autoclaving), Dry Heat (Flaming, baking), Filtration, Solvent, Radiation.	2
Seed viability testing, testing of pollen viability	Rolled Paper Towel Test, Excised Embryo Test, Chemical Test, IKI (Iodine potassium iodide), TTC (2,3,5- triphenyl tetrazolium chloride).	4
Tissue culture of crop plants	Sterilization of glassware tools/vessels, Preparation and sterilization of explants, Production of callus from explants, Proliferation of cultured callus, Sub culturing of callus, Suspension culture.	2
Description of flowering plants in botanical terms in relation to taxonomy	Aestivation, Number of stamens , Gynoecium, Family; Solanaceae, Fabaceae, Liliaceae, Plant Nomenclature, Binomial classification system, Morphological Characteristics; Plant type, Leaf type, Fruit type.	2

Course Outcomes

- Student will be skilled on safety measures and handling of chemical substances while in Lab.
- Skilled on use, washing and sterilization of glassware along with drying and preparation of solution of the laboratory.
- Skilled on handling, preparation of buffers with neutralization of acid and bases and handling of laboratory equipments.
- Skilled on testing of seed viability, preparation of media and tissue culture of plants with description of flowering plants.

Recommended Text Books/ Reference Books

- CRC Hand Book of Laboratory Safety- Furr AK. 2000. CRC Press.
- A Handbook of Laboratory Solutions- Gabb MH & Latchem WE. 1968. Chemical Publ. Co.