

आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश
IFTM University, Moradabad, Uttar Pradesh
NAAC ACCREDITED

SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING
DEPARTMENT OF AGRICULTURAL SCIENCES

MASTER OF SCIENCE AG. (AGRONOMY)

[w.e.f. ACADEMIC SESSION 2021 – 22]

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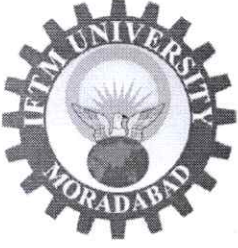
N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244102

Website: www.iftmuniversity.ac.in


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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL SCIENCES

CBCS Based Course Structure and Syllabi

of

Master of Science Ag. (Agronomy)

[w.e.f. Academic Session 2021 – 22]

Summary

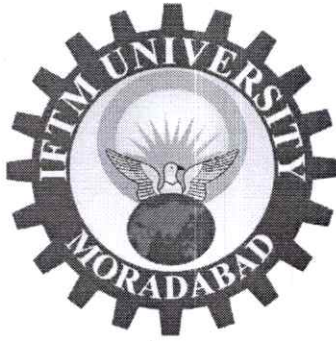
Programme:	Master of Science Ag. (Agronomy)
Programme Level:	Degree (Post Graduation)
Duration:	Two Years (Four semesters) Full time
Medium of Instruction:	English
Minimum Required Attendance:	75%
Maximum Credits:	60

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Programme: M.Sc. Ag. (Agronomy)

Programme Outcomes (POs):

Students completing this course will be able to:

1. Apply the theoretical and conceptual knowledge obtained at graduation level in the real field conditions at local, national and international levels.
2. Deeply elaborate various fundamental concepts learned at graduation level for local and national levels.
3. Learn the advanced production techniques of various agronomic crops as well as their commercial utilization including import and export scenario for national, international and global prospects.
4. Apply the concepts of crop rotation, inter cropping and multi cropping to select the best possible crop and other enterprise combination at local and national levels.
5. Understand the effect of various biotic and abiotic factors on crop production and the remedies associated with it at local and national level.
6. Understand the basic principles of experimental design and learn the basics of field data collection, it's analysis and interpretation to draw valid results and conclusions for global level.
7. Understand the importance of integration of different possible ways of nutrient management, weed management and pest management to maximize the profit as well as to maintain ecological balance for local, national and international platforms.

Program Specific Outcomes:

On completion of two year M.Sc. Ag. (Agronomy) degree programme, the students will be able to:

PSO-1: Generate conceptual thinking and problem solving abilities.

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PSO-2: Enhance self learning and improve their own performance.

PSO-3: Inculcate a sense to serve the farming community and to work for the betterment of the society.

PSO-4: Inculcate a sense of environment saving by developing techniques which are more environment friendly.

Vsw

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School of Agricultural Sciences & Engineering, IFTM University
M.Sc. Ag. (Agronomy), Effective from Session 2021-22

M.Sc. Ag. (Agronomy)			
Basic Structure: Distribution of Courses			
S. No.	Type of Course	No. of Courses	Credits
1	Major Course	05	17
2	Minor Course	01	04
3	Supporting Course	02	08
4	Elective Course	03	09
5	Research and Seminar		22

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M. Sc. Ag. (Agronomy)

Major Courses			
Theory			
1.	MAS 101	Agronomy of Kharif Crops	3
2.	MAS 201	Principles and Practices of Water Management	3
3.	MAS 202	Agronomy of Rabi Crops	3
4.	MAS 301	Principles and Practices of Weed Management	3
5.	MAS 302	Modern Concepts in Crop Production	3
Practical's			
1.	MAS 251	Water Management Lab	1
2.	MAS 351	Weed Management Lab	1
Minor Courses			
1	MAS 102	Principles and Practices of Soil Fertility and Nutrient Management	3
Practical's			
1.	MAS 151	Soil Fertility and Nutrient Management Lab	1
Supporting Courses			
1.	MAS104	Principles of Plant Physiology	3
2.	MMAG204	Agricultural Statistics and Experimental Design	3
Practical's			
1.	MAS 154	Plant Physiology Lab	1
2.	MMAG254	Agricultural Statistics and Experimental Design Lab	1
Elective Courses			
1.	MAS 103A	Elective I *	3
2.	MAS 203 B	Elective II*	3
3.	MAS 303C	Elective III*	3
Research & Seminar			
1	MAS 352	Seminar	1
2	MAS 354	Pre- Dissertation	1
3	MAS 451	Dissertation Work	20

Elective I

S.N.	CODE	Name of Elective
1.	MAS 103 I	Cropping Systems & Sustainable Agriculture
2.	MAS 103 II	Fodder and Forage Crops
3.	MAS 103 III	Conservation Agriculture
4.	MAS 103IV	Soil, Plant, Water and Seed Testing
5.	MAS 103V	Current Trends in Agronomy
6.	MAS 103VI	Crop ecology
7.	MAS103VII	Agrometeorology and Crop Weather Forecasting
8.	MAS103VIII	Weather and Climate Risk Management

Elective II

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S.N.	CODE	Name of Elective
1.	MAS 203 I	Principles and Practices Organic Farming
2.	MAS 203 II	Medicinal, Aromatic & Under Utilized Crops
3.	MAS 203III	Agronomy of Major Cereals and Pulses
4.	MAS-203IV	Bio-fortification in Cereals
5.	MAS203V	Recent Trend in Crop Growth and Productivity
6.	MAS203VI	Crop Production and System Modelling
7.	MAS203VII	Diagnosis of Nutritional Deficiencies in Field Crop and Their Remedial Measures
8.	MAS203VIII	Recent Trends in Weed Management

Elective III

S.N.	CODE	Name of Elective
1.	MAS 303 I	Dryland Farming & Watershed Management
2.	MAS 303 II	Soil Conservation & Watershed Management
3.	MAS-303 III	Agrostology and Agro-Forestry
4.	MAS-303 IV	Agronomy of Commercial Crops
5.	MAS 303V	Stress crop production
6.	MAS303VI	Physiological and Molecular responses of Plant to Abiotic Stress
7.	MAS303VII	Advance in Crop Growth and Productivity
8.	MAS303VIII	Plant Growth Modelling and Simulation

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STUDY & EVALUATION SCHEME
M. Sc. Ag. (Agronomy)

YEAR - I, SEMESTER - I

S.N.	Course Code	Course Name	Periods			Evaluation Scheme			Course Total	Credits	
			L	T	P	Mid Term Exam	AS +AT	Total			External Exam
Theory											
1.	MAS 101	Agronomy of Kharif Crops	3	0	0	20	10	30	70	100	3
2.	MAS 102	Principles and Practices of Soil Fertility and Nutrient Management	3	0	0	20	10	30	70	100	3
3.	MAS 103A	Elective I	3	0	0	20	10	30	70	100	3
4.	MAS104	Principles of Plant Physiology	3	0	0	20	10	30	70	100	3
Practical / Project											
5.	MAS 151	Soil Fertility and Nutrient Management Lab	0	0	2	20	10	30	70	100	1
6.	MAS 154	Plant Physiology Lab	0	0	2	20	10	30	70	100	1
Total			12	0	4	-	-	-	-	600	14

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M. Sc. Ag. (Agronomy)

YEAR – I, SEMESTER – II

S.N.	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credits
			L	T	P	Mid Term Exam		External Exam			
						CT	AS +AT		Total		
Theory											
1.	MAS 201	Principles and Practices of Water Management	3	0	0	20	10	30	70	100	3
2.	MAS 202	Agronomy of Rabi Crops	3	0	0	20	10	30	70	100	3
3.	MAS 203 B	Elective II	3	0	0	20	10	30	70	100	3
4.	MMAG204	Agricultural Statistics and Experimental Design	3	0	0	20	10	30	70	100	3
Practical / Project											
5.	MAS 251	Water Management Lab	0	0	2	20	10	30	70	100	1
6.	MMAG254	Agricultural Statistics and Experimental Design Lab	0	0	2	20	10	30	70	100	1
Total			12	0	4	-	-	-	-	600	14

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M. Sc. Ag. (Agronomy)

YEAR - II, SEMESTER – III

S.N.	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credits
			L	T	P	Mid Term Exam			External Exam		
						CT	AS +AT	Total			
Theory											
1.	MAS 301	Principles and Practices of Weed Management	3	0	0	20	10	30	70	100	3
2.	MAS 302	Modern Concepts in Crop Production	3	0	0	20	10	30	70	100	3
3.	MAS 303C	Elective III	3	0	0	20	10	30	70	100	3
Practical / Project											
4.	MAS 351	Weed Management Lab	0	0	2	20	10	30	70	100	1
5.	MAS 352	Seminar	0	0	2	-	-	100	-	100	1
6.	MAS 354	Pre- Dissertation	0	0	2	-	-	30	70	100	1
Total			9	0	6	-	-	-	-	600	12

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STUDY & EVALUATION SCHEME
M. Sc. Ag. (Agronomy)

YEAR - II, SEMESTER – IV

S.N.	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credits	
			L	T	P	Mid Term Exam		External Exam				
						CT	AS +AT		Total			
Theory												
-	-	-	-	-	-	-	-	-	-	-	-	-
Practical's / Project												
1.	MAS 451	Dissertation Work	0	0	40	-	-	300	300	600	20	
Total			-	-	40	-	-	-	-	600	20	

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List of Electives

Group - A

Elective I

S.N.	CODE	Name of Elective
1.	MAS 103 I	Cropping Systems & Sustainable Agriculture
2.	MAS 103 II	Fodder and Forage Crops
3.	MAS 103 III	Conservation Agriculture
4.	MAS 103IV	Soil, Plant, Water and Seed Testing
5.	MAS 103V	Current Trends in Agronomy
6.	MAS 103VI	Crop ecology
7.	MAS103VII	Agrometeorology and Crop Weather Forecasting
8.	MAS103VIII	Weather and Climate Risk Management

Group - B

Elective II

S.N.	CODE	Name of Elective
1.	MAS 203 I	Principles and Practices Organic Farming
2.	MAS 203 II	Medicinal, Aromatic & Under Utilized Crops
3.	MAS 203III	Agronomy of Major Cereals and Pulses
4.	MAS-203IV	Bio-fortification in Cereals
5.	MAS203V	Recent Trend in Crop Growth and Productivity
6.	MAS203VI	Crop Production and System Modelling
7.	MAS203VII	Diagnosis of Nutritional Deficiencies in Field Crop and Their Remedial Measures
8.	MAS203VIII	Recent Trends in Weed Management

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M. Sc. Ag. (Agronomy)

Group - C

Elective III

S.N.	CODE	Name of Elective
1.	MAS 303 I	Dryland Farming & Watershed Management
2.	MAS 303 II	Soil Conservation & Watershed Management
3.	MAS-303 III	Agrostology and Agro-Forestry
4.	MAS-303 IV	Agronomy of Commercial Crops
5.	MAS 303V	Stress crop production
6.	MAS303VI	Physiological and Molecular responses of Plant to Abiotic Stress
7.	MAS303VII	Advance in Crop Growth and Productivity
8.	MAS303VIII	Plant Growth Modelling and Simulation

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MAS-101

Agronomy of Kharif Crops

L:T:P : 3:1:0

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 all Kharif Crops given below

Unit I

Cereals: Rice, Maize, Millets **for skill development, employability and entrepreneurship.**

Maize:

1. Study of the plant morphology

Millets: Sorghum.

1. Study of the plant morphology

Unit II

Pulses: Pigeonpea, Urdbean and Mungbean **for skill development.**

Unit III

Oilseeds: Groundnut, Castor, Sesamum, Sunflower and soybean **for better skilling of employability.**

Unit IV

Forage crops: Maize, Sorghum, Guar, Cowpea, Bajra, etc. **for entrepreneurship.**

Unit V

Fibre crops: Cotton, Jute and Sun hemp **for skill development, employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of crop production for higher yield and return **for skill development.**

CO2: Understand the study of the plant morphology of maize **to provide employability and entrepreneurship**


CO3: Understand the cultivation of oilseeds **knowledge for better employability in industry.**

CO4: Understand the importance of forage crop cultivation **for provide employability and entrepreneurship.**

CO5: Understand the concept of fibre crops cultivation **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


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	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

1. Das, N.R. 2007. Introduction to Crops in India. Scientific Publication.
2. Das, P.C. 1997. Oilseed Crops of India. Kalyani Publication.
3. Prasad, Rajendra, 2002. Text Book of Field Crop Production. ICAR.
4. Singh, C., Singh, P. & Singh, R. 2003. Modern Techniques of Raising Field Crops. Oxford & IBH.
5. Singh, S.S. 1998. Crop Management. Kalyani Publication.

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- <https://agrimoon.com>
- <https://tnau.ac.in>
- <https://iasri.icar.gov.in>
- <https://ecourseonline.iasri.res.in>

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MAS-102

Soil Fertility and Nutrient Management

L:T:P : 3:1:0

Unit I

Soil fertility and productivity-factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming - basic concepts and definitions **for skill development.**

Unit II

Criteria of essentiality of nutrients; Essential plant nutrients—their functions, deficiency and toxicity symptoms of major and micro nutrients and remedial measure; transformation and dynamics of major plant nutrients **for skilling of employability.**

Unit III

Kinds of fertilizers-straight, complex and bulk blended; methods of fertilizer application; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades **for and entrepreneurship development.**

Unit IV

Fertilizer application in cropping systems direct, residual and cumulative effects; integrated nutrient management; agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions **for skill up of employability and entrepreneurship.**

Unit V

Organic manures, compost, green manures, vermi-compost, bio-fertilizers and fertilizers application; foliar application and its concept **for entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Soil fertility and productivity-factors affecting; features of good soil management **for skill development.**

CO2: Understand the Criteria of essentiality of nutrients; Essential plant nutrients—their functions **to provide employability and entrepreneurship**

CO3: Understand the Kinds of fertilizers-straight, complex and bulk blended **knowledge for better employability in industry.**

CO4: Understand the importance of Fertilizer application in cropping systems direct, residual and cumulative effects; integrated nutrient management **for provide employability and entrepreneurship.**

CO5: Understand the concept of rganic manures, compost, green manures, vermi-compost, bio-fertilizers **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3

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CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

1. Brady, N.C. & Weil, R.R. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
2. Fageria, N.K., Baligar. V.C. & Jones, C.A. 1991. Growth and Mineral Nutrition of Field Crops. Marcel Dekker.
3. Havlin, J.L., Beaton, J.D., Tisdale, S.L. & Nelson. W.L. 2006. Soil Fertility and Fertilizers. 7th Ed. Prentice Hall.
4. Prasad, R. & Power, J.F. 1997. Soil Fertility Management for Sustainable Agriculture. CRC Press.
5. Yawalkar, K.S., Agrawal, J.P. & Bokde, S. 2000. Manures and Fertilizers. Agri-Horti Publ.

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- <https://ecourseonline.iasri.res.in>

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MAS-104

Principles of Plant Physiology

L:T:P : 3:1:0

Unit I

Cell organelles and their physiological functions, structure and physiological functions of cell wall, cell inclusions; cell membrane structure and functions **for skill development.**

Unit II

Soil and plant water relations, water and its role in plants, properties and functions of water in the cell water relations-cell water terminology, water potential of plant cells; Mechanism of water uptake by roots-transport in roots, aquaporins **for skill development.**

Unit III

Movement of water in plants – Mycorrhizal association on water uptake; Water loss from plants-Energy balance-Solar energy input-energy dissipation at crop canopy level-evapotranspiration transpiration –Driving force for transpiration, plant factors influencing transpiration rate **for better skilling of employment and entrepreneurship.**

Unit IV

Stomata structure and function – mechanism of stomatal movement, antitranspirants. Physiology of water stress in plants: Influence of water stress at cell, organ, plant and canopy levels. Indices for assessment of drought resistance **for employability.**

Unit V

The role of mineral nutrients in plant metabolism; Essential elements, classification based on function of elements in plants; Physiological and metabolic functions of mineral elements, critical levels, deficiency symptoms, nutrient deficiency and toxicity; Foliar nutrition, Uptake of mineral elements in plants –Mechanisms of uptake-translocation of minerals in plants **for employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Cell organelles and their physiological functions **for skill development.**

CO2: Understand Soil and plant water relations, water and its role in plants, properties and functions of water in the cell water relations-cell water terminology **to provide employability and entrepreneurship**

CO3: Understand the Movement of water in plants – Mycorrhizal association on water uptake **knowledge for better employability in industry.**

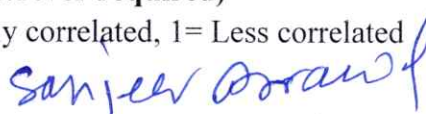
CO4: Understand the importance of Stomata structure and function – mechanism of stomatal movement **for provide employability and entrepreneurship.**

CO5: Understand the concept of the role of mineral nutrients in plant metabolism; Essential elements **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


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	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

- Hopkins, W.G. & Huner, N.P.A. 2004. Introduction to Plant Physiology. John Wiley & Sons.
- Salisbury, F.B. & Ross, C. 1992. Plant Physiology. 4th Ed. Wadsworth Publ.
- Taiz, L. & Zeiger, E. 2006. Plant Physiology. 4th Ed. Sinauer Associates.
- Gardner FP, Pearce RB & Mitchell RL. 1988. Physiology of Crop Plants. Scientific Publ.
- Pessarakli M. Handbook of Plant and Crop Physiology. CRC Press. Selected reviews and articles from Periodicals and Journals.

Web Sources:

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MAS-201 Principles and Practices of Water Management

L:T:P : 3:1:0

Unit I

Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states **for skill development and entrepreneurship.**

Unit II

Soil water movement in soil and plants; transpiration; soil-water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition **knowledge for better employability in industry.**

Unit III

Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; micro irrigation system; fertigation; management of water in controlled environments and poly-houses **for better skilling of employability and Entrepreneurship.**

Unit IV

Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency **for skill up of entrepreneurship.**

Unit V

Excess of soil water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing **for employability and Entrepreneurship development.**

Course Outcomes:

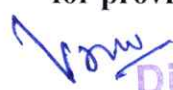
Students completing this course will be able to:

CO1: Understand the basic concepts of Water and its role in plants; water resources of India **for skill development.**

CO2: Understand Soil water movement in soil and plants; transpiration; soil-water-plant relationships **to provide employability and entrepreneurship**

CO3: Understand the Soil, plant and meteorological factors determining water needs of crops; scheduling **knowledge for better employability in industry.**

CO4: Understand the importance of Water management of the crops and cropping systems **for provide employability and entrepreneurship.**


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CO5: Understand the concept of Excess of soil water and plant growth; water management in problem soils; drainage **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

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2. Michael, A.M. 1978. Irrigation: Theory and Practice. Vikas Publ.
3. Paliwal, K.V. 1972. Irrigation with Saline Water. IARI Monograph, New Delhi.
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5. Prihar, S.S. & Sandhu, B.S. 1987. Irrigation of Food Crops - Principles and Practices. ICAR.
6. Reddy, S.R. 2000. Principles of Crop Production. Kalyani Publication.
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MAS-202

Agronomy of Rabi Crops

L:T:P : 3:1:0

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 all Rabi Crops given below

Unit I

Cereals: Wheat and Barley **for skill development.**

1. Growth and development studies in wheat.

Unit II

Pulses: Chickpea, Lentil and Peas **for skill development.**

1. Study of yield contributing characters and estimation of yield

Unit III

Oil Seeds: Rape seed-mustard, Linseed, Safflower **for better skilling of employability and Entrepreneurship.**

Unit IV

Sugar crops Sugarcane and Sugarbeet **for skill development and employability.**

Unit V

Forage crops: Oat, Barley and Berseem **for entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Growth and development studies in wheat **for skill development.**

CO2: Understand the scientific cultivation methods of pulses **to provide employability and entrepreneurship**

CO3: Understand the scientific cultivation methods of oilseeds **knowledge for better employability in industry.**

CO4: Understand the importance of scientific cultivation methods of sugar crops **for provide employability and entrepreneurship.**

CO5: Understand the concept of scientific cultivation methods of forage crops **for skill development.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1

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CO5	1	3	3	2	1
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CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2


References

1. Chatterjee, B.N. 1989. Forage Crop Production – Principles and Practices. Oxford & IBH.
2. Das, N.R. 2007. Introduction to Crops of India. Scientific Publication.
3. Das, N.R. 2007. Introduction to Crops of India. Scientific Publication.
4. Hunsigi, G. & Krishna, K.R. 1998. Science of Field Crop Production. Oxford & IBH.
5. Narayanan, T.R. & Dabadghao, P.M. 1972. Forage Crops of India. ICAR.
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MMAG-204

Experimental Statistics

L:T:P : 3:1:0

Unit I

Introduction to statistics, review of basic statistical methods, mean, variance, standard deviation, random experiment, discrete and continuous variables, random variable, probability and problems based on probability; Probability distribution, Binomial, Poisson, and normal distribution with examples **for skilling of employability and entrepreneurship.**

Unit II

Sampling distribution, of mean, chi-square, t and F distribution along with their properties and use of corresponding tables, unbiased estimator, standard error; Testing of hypothesis, Introduction, definition of statistical hypothesis, Null and alternative hypothesis, Two types of errors, critical region, level of significance, power of a test, tests based on normal, t, chi-square and F distribution **for employability in industry.**

Unit III

Analysis of variance, Definition of ANOVA, assumptions, assignable and non-assignable factors, models and analysis for one way and two-way classification; Simple correlation and regression analysis, Definition of correlation types of correlation, scatter diagrams, Pearson's product moment correlation coefficient, tests of significance based on correlation coefficient (one, two or more than two sample case) **for better skilling of employability and entrepreneurship.**

Unit IV

Regression analysis, fitting of regression lines tests of significance for regression coefficient, comparison of two regression coefficients; Multiple regression and correlation, fitting of multiple regression equation, tests about partial regression coefficients, calculation of multiple correlation coefficient and coefficient of multiple determination **for better skilling of employability.**

Unit V

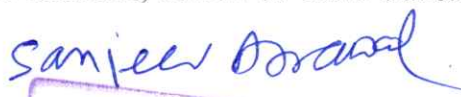
Partial correlation coefficients, calculation for partial correlation for Ist and IInd orders and testing of significance of partial correlation coefficients; Rank correlation coefficient, calculation and testing its significance; Non-linear regression analysis, fitting of simple non-linear regression equations using transformations; Introduction to design of experiment, experimental error, basic principles of design of experiment, randomization, replication, local control and their functions **for better skilling of employability.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts to statistics, review of basic statistical methods **for skill development.**


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CO2: Understand the sampling distribution of mean, chi-square, t and F distribution along with their properties **provide employability and entrepreneurship**

CO3: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO4: Understand the Analysis of variance, Definition of ANOVA, assumptions **for provide employability and entrepreneurship.**

CO5: Understand the concept of Partial correlation coefficients, calculation for partial correlation **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

1. Bhattacharyya, G.K. and Johnson, R.A. 1997. Statistical concepts and methods, John Wiley and Sons, New York.
2. Crozon, F.E. and Cowden, D.J. 1986. Applied General Statistics, Prentice Hall of India, New Delhi.
3. Gomez, K.A. and Gomez, A.A. 1984. Statistical procedure for Agricultural Research, John Wiley and Sons, New York.
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MAS-103 (I) Cropping Systems and Sustainable Agriculture L:T:P : 3:1:0

Unit I

Cropping systems: definition, indices and its importance; physical resources, soil and water management in cropping systems; assessment of land use **for skill development.**

Unit II

Concept of sustainability in cropping systems and farming systems, scope and objectives; production potential under monoculture cropping, multiple cropping, alley cropping, sequential cropping and intercropping, mechanism of yield advantage in intercropping systems **for skill up of entrepreneurship.**

Unit III

Above and below ground interactions and allelopathic effects; competition relations; multi-storied cropping and yield stability in intercropping, role of non-monetary inputs and low cost technologies; research need on sustainable agriculture **for better skilling of employability.**

Unit IV

Crop diversification for sustainability; role of organic matter in maintenance of soil fertility; crop residue management; fertilizer use efficiency and concept of fertilizer use in intensive cropping system **for entrepreneurship development.**

Unit V

Plant ideotype types for drylands; plant growth regulators and their role in sustainability **for skill development and employability.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Cropping systems **for skill development.**

CO2: Understand the concept of sustainability in cropping systems and farming systems **to provide employability and entrepreneurship**

CO3: Understand the above and below ground interactions and allelopathic effects **knowledge for better employability in industry.**

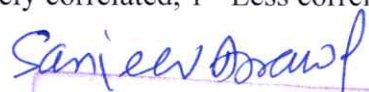
CO4: Understand the importance of Crop diversification for sustainability; role of organic matter in maintenance of soil fertility **for provide employability and entrepreneurship.**

CO5: Understand the concept of Plant ideotype types for drylands; plant growth regulators and their role in sustainability **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


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	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

1. Palaniappan, S.P. & Sivaraman, K. 1996. Cropping Systems in the Tropics; Principles and Management. New Age.
2. Panda, S.C. 2003. Cropping and Farming Systems. Agrobios.
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MAS – 103 (II)

Fodder and Forage Crops

L:T:P : 3:1:0

Unit I

Adaptation, distribution, varieties improvement, agro-techniques and quality aspects including anti-quality factors of important fodder crops like maize, bajra, guar, cowpea, oats, barley, berseem etc. **for skill development and entrepreneurship.**

Unit II

Adaptation, distribution, varieties improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasses- lime, etc. **for skill development and entrepreneurship.**

Unit III

Year-round fodder production and management, preservation and utilization of forage and pasture crops; Canopy measurement, yield and quality estimation, viz. crude protein, NDF, ADF, lignin, silica, cellulose etc; of various fodders and forage crops; Anti-quality components like HCN in sorghum and such factors in other crops; Hay and silage making and economics of their preparation **for better skilling of employment and entrepreneurship development.**

Unit IV

Principles and methods of hay and silage making; chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage; use of physical and chemical enrichments and biological methods for improving nutrition; value addition of poor quality fodder **for employability in industry and entrepreneurship.**

Unit V

Economics of forage cultivation uses and seed production techniques **for entrepreneurship development.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Adaptation, distribution, varieties improvement, agro-techniques and quality aspects including anti-quality **for skill development.**

CO2: Understand Adaptation, distribution, varieties improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasses- lime **to provide employability and entrepreneurship**


CO3: Understand the Year-round fodder production and management, preservation and utilization of forage and pasture crops **knowledge for better employability in industry.**

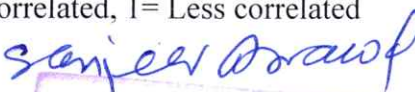
CO4: Understand the importance of Principles and methods of hay and silage making; chemical and biochemical changes **for provide employability and entrepreneurship.**

CO5: Understand the concept of Economics of forage cultivation uses and seed production techniques **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


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	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

1. Chatterjee, B.N. 1989. Forage Crop Production - Principles and Practices. Oxford & IBH.
2. Das, N.R. 2007. Introduction to Crops of India. Scientific Publ.
3. Narayanan, T.R. &Dabadghao, P.M. 1972. Forage Crops of India. ICAR.
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MAS 103 III

Conservation Agriculture

L: T: P 3:1:0

Objective: To Conservation agriculture conserves natural resources, biodiversity and labor. It increases available soil water, reduces heat and drought stress, and builds up soil health in the longer term.

UNIT-I

Introduction to Soil and Water Conservation causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion **for skill development.**

UNIT-II

Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques **for skill development and employability.**

UNIT-III

Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing **for skill development.**

UNIT-IV

Grassed water ways and their design. Water harvesting and its techniques **for skill development and entrepreneurship.**

UNIT-V

Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures **for skill development.**

Course Outcomes

Students completing this course will be able to:

CO1: Know and understand what conservation agriculture entails **for skill development.**

CO2: Be able to name the advantages and disadvantages of conservation agriculture **for skill development and employability.**

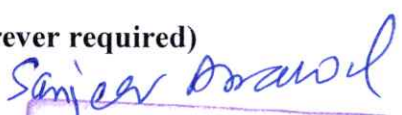
CO3: Be able to identify the different no-tillage implements and their use **for skill development.**

CO4: Know and understand the relationship between soil fertility and plant health **for skill development and entrepreneurship.**

CO5: Be able to understand what is required for optimal plant growth and the efficient use of fertilizers **for skill development.**

PO-CO Mapping (Please write 3, 2, 1 wherever required)


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Note: 3= highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	3	2
CO3	3	2	3
CO4	3	2	2
CO5	3	2	2

Reference:

1. A Text Book of Surveying and Levelling - P.C. Purnima, Orient Longman, Chennai (2006)
2. Land & Water Management Engineering - V.V.N. Murty, Kalyani Publishers, Delhi (2002)
3. Soil Erosion and Conservation - R.P. Tripathy and H.P. Singh, Kalyani Publishers, Delhi (2000).

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MAS 103IV

Soil, Plant, Water and Seed Testing

L: T: P 3:1:0

Objective: To determine the planting value of seed. To determine legal requirement of seed as planting material. To determine the real seed rate. To determine the condition of seed whether it is alive, dormant or dead. To determine the viability and vigor of seed.

UNIT-I

Principle of pH meter, EC meter, spectrophotometer, flame photometer and AAS. Soil analysis: Objectives, sampling of soil, procedure and precautions **for skill development.**

UNIT-II

Determination of texture, bulk density. Interpretation of analytical data viz., pH, EC, organic carbon, N, P, K, S and micronutrients (Fe, Mn, Zn, Cu, B) and nutrient index **for skill development.**

UNIT-III

Plant analysis: Sampling stages and plant part to be sampled. Analysis of nutrients, Quantitative rating of plant analysis data and interpretation of results, critical nutrient concentration, critical nutrient ranges **for skill development and entrepreneurship.**

UNIT-IV

Water analysis: Quality criteria, classification and suitability of irrigation water and water quality index **for skill development.**

UNIT-V

Seed: Introduction, definition and importance, seed germination, viability, vigor and storage. Use of soil testing kit for major and micronutrient analyzer **for skill development, employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO 1: To have knowledge about the staple food crops and their cultivation practices with post-harvest technologies **for skill development.**

CO 2: Understand the determination of texture, bulk density and nutrient index **for skill development.**

CO 3: To understand the analysis of plant and nutrient, data analysis and interpretations **for skill development and entrepreneurship.**

CO 4: To gain knowledge about Quality criteria, classification and suitability of irrigation water **for skill development.**


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CO 5: Understand the use of soil testing kit for major and micronutrient analyzer **for skill development, employability and entrepreneurship.**

PO-CO Mapping

Note: 3= highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	2	2
CO3	3	2	3
CO4	3	2	2
CO5	3	3	3

Reference:

1. Soil Chemical Analysis – M. L. Jackson, Prentice Hall of India Pvt. Ltd. New Delhi (1973)
2. Soil and Plant Analysis – C. S. Piper, Scientific Publishers, India (2010)
3. Methods of Soil Analysis, Part-2 – A. L. Page, R. H. Miller and R. Keeney, American Society of Agronomy and Soil Science, Society of America Publication, Madison, Wisconsin, USA (1982)
4. Analytical Agricultural Chemistry – S. I. Chopra and J. S. Kanwar, Kalyani Publishers (2014)
5. Seed Technology - R. L. Agarwal, Oxford & IBH Co. Pvt. Ltd., New Delhi (1997)
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MAS 103V

Current Trends in Agronomy

L: T: P 3:1:0

Objective To acquaint the students about recent advances in agricultural production for skill, employability and entrepreneurship development

UNIT I

Agro-physiological basis of variation in yield, recent advances in soil plant-water relationship for skill development

UNIT II

Globalization of agriculture and WTO, precision agriculture, contract farming, organic farming, marketing and export potential of organic products, certification, labeling and accreditation procedures for skill and employability development

UNIT III

Crop residue management in multiple cropping systems; latest developments in plant management, weed management, cropping systems, grassland management, agroforestry, allelopathy for skill and employability development

UNIT IV

GIS, GPS and remote sensing for crop management, global warming, GM crops, seed production technology; seed certification, seed multiplication, hybrid seed production, etc. for skill and employability development

UNIT V

Concepts of system approach in agriculture; holistic approach of farming systems, dryland farming, sustainable agriculture and research methodology in Agronomy for skill and employability development

Course Outcomes:

Students completing this course will be able to:

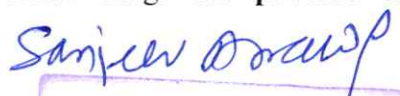
CO1: Understand the basic concepts of Agro-physiological basis of variation in yield, recent advances in soil plant-water relationship for skill development **for skill development.**

CO2: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship.**

CO3: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO4: Understand the importance of weed management in agriculture and also about advantages and disadvantages of herbicide usage **for provide employability and entrepreneurship.**


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CO5: Understand the concept of holistic approach of farming systems **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Agarwal RL. 1995. Seed Technology. Oxford & IBH.
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MAS 103VI

CROP ECOLOGY

L: T: P 3:1:0

Objective: To acquaint the students about the agricultural systems, agro-ecological regions, and adaptation of crops to different agro-climatic conditions.

UNIT I

Concept of crop ecology, agricultural systems, ecology of cropping systems, principles of plant distribution and adaptation, crop and world food supply.

UNIT II

Ecosystem characteristics, types and functions, terrestrial ecology, flow of energy in ecosystem, ecosystem productivity, biomass, and succession and climax concept.

UNIT III

Physiological response of crop plants to light, temperature, CO₂, moisture and solar radiation; influence of climate on photosynthesis and productivity of crops; effect of global climate change on crop production.

UNIT IV

Exploitation of solar energy in crops; vertical distribution of temperature; efficiency in crop production.

UNIT V

Competition in crop plants; environmental pollution, ecological basis of environmental management and environment manipulation through agronomic practices; improvement of unproductive lands through crop selection and management.

Course outcomes:

Students completing this course will be able to:

CO1: On successful completion of this course a student will be able to: Understand the basics concepts of crop ecology **for development of skills.**

CO2: Understand all about the ecosystem **for development of skill and employability.**

CO3: Understand the physiological response and climate change on crop plant **for skill development and employability.**

CO4: Understand the solar energy **for skill development and employability.**

CO5: Understand the completion of crop plants with environment **for skill development, entrepreneurship and employability.**

PO-CO Mapping (Please √ wherever required)

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	1	1
CO2	3	3	3	1	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	1	1	1	1

CO-Curriculum Enrichment Mapping (Please √ wherever required)

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	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	3

References:

1. David J. Connor, Robert S. Loomis, Kenneth G. Cassman Crop Ecology: Productivity and Management in Agricultural Systems. Cambridge University Press; 2nd edition (28 April 2011); CBS PUBLISHERS & DISTRIBUTORS PVT. LTD
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- <https://agris.fao.org/agris-search/search.do?recordID=US201301759357>
- <https://www.nhbs.com/en/crop-ecology-book>
<https://www.cambridge.org/core/books/crop-ecology/B7B303F0053FFB3433919B507D8F9579>

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MAS103VII Agrometeorology and Crop Weather Forecasting L: T: P 3:1:0

Objective To impart theoretical knowledge of physical processes occurring in atmosphere.

UNIT I

Earth and its atmosphere in relation to sun and seasons; solar radiation; heat balance of earth and atmosphere; radiation in the atmosphere-energy balance at different surfaces and significance of different components and their estimation; Angstrom equation and estimation of radiation parameters; nature of radiation, physical and physiological processes important to radiation; laws of radiation: Planck's law, Stefan-Boltzmann's law, Wien's displacement law, Kirchoff's law, Beer's law and Lambert's cosine law; theories of transmissivity; extinction coefficient; length of day; albedo of a surface; atmospheric and astronomical factors affecting depletion of solar radiation received on the earth; selective absorption by constituents of atmosphere; Rayleigh and Mie scattering; direct and diffuse radiation; heat transfer: conduction, convection and radiation; concept of latent and sensible heat; radiant flux and flux density **to provide employability and entrepreneurship**

UNIT II

Temperature in the atmosphere: distribution of temperature in time and space, variation in temperature with height; subdivisions of the atmosphere: troposphere, stratosphere; atmospheric dynamics-atmospheric motion under balanced forces **to provide employability and entrepreneurship**

UNIT III

Gas laws; pressure gradient, isobars, hydrostatic equation and its application; coriolis force; geostrophic, gradient and cyclostrophic winds; pressure systems, cyclonic and anticyclonic motions, trough, ridge, col, thermal wind, contour charts, variation in pressure with height **to provide employability and entrepreneurship**

UNIT IV

Concepts of specific heats at constant volume and pressure; first and second laws of thermodynamics and their applications to atmosphere; vertical stability of atmosphere, virtual temperature and potential temperature; moist and dry adiabatic processes; atmospheric stability and DALR and SALR stability criteria for atmosphere-conditional instability and auto convective stability **to provide employability and entrepreneurship**

UNIT V

Meteorological temperatures: dew point temperature, wet bulb temperature, equivalent temperature and equivalent potential temperature; thermodynamic diagrams and their uses; dynamics of atmosphere and general circulation; equations of motion; turbulence, vorticity and atmospheric waves **to provide Skill and entrepreneurship**

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Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Earth and its atmosphere in relation to sun and seasons **for skill development.**

CO2: Understand Temperature in the atmosphere: distribution of temperature in time and space, variation in temperature with height **to provide employability and entrepreneurship**

CO3: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO4: Understand the importance of Concepts of specific heats at constant volume and pressure; first and second laws of thermodynamics and their applications to atmosphere; vertical stability of atmosphere, virtual temperature and potential temperature **for provide employability and entrepreneurship.**

CO5: Understand the concept of Meteorological temperatures: dew point temperature, wet bulb temperature, equivalent temperature and equivalent potential temperature; thermodynamic diagrams and their uses; **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1


CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

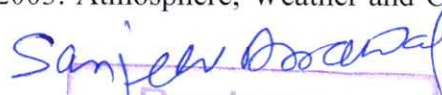
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

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5. Petterson S. 1958. Introduction to Meteorology. McGraw Hill.
6. Trewartha Glenn T. 1954. An Introduction to Climate. McGraw Hill

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- <https://ecourseonline.iasri.res.in>


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MAS103VIII

Weather and Climate Risk Management

L: T: P 3:1:0

Objective To impart theoretical knowledge of climatology.

UNIT I

Air masses and their properties: source regions, processes determining the characteristics of air masses, properties of air masses, classification of air masses, air masses and fronts, important air masses over India; models of secondary circulation in the atmosphere; intratropical convergence zone, mountain and valley breezes, land and sea breezes, sand and dust whirls due to thermal circulation; Fohn and Chinook winds, extra tropical cyclones, tropical cyclones and their structures **to provide Skill and entrepreneurship**

UNIT II

Water vapour or humidity in the atmosphere-various humidity parameters: vapour pressure, specific humidity, relative humidity, mixing ratio, absolute humidity, dew point, wet bulb temperature, saturation deficit, and their interrelationships; psychrometric equation, and stability and instability conditions in the atmosphere; entropy-therpigram; condensation and precipitation processes-physical basis of atmospheric condensation-growth by coalescence and ice nucleation; lapse rates-ascent of dry and moist air; condensation process-artificial rain making, Bergeron Findeisen theory; condensation forms-dew, fog, mist, frost, cloud, haze, rain, hail, dust storm and thunderstorms; clouds and their description and classification; evaporation and rainfall; hydrologic cycle **to provide Skill and entrepreneurship**

UNIT III

Effects of earth's rotation on zonal distribution of radiation, rainfall, temperature and wind; the trade winds, equatorial trough and its movement; the SE Asian monsoon, mechanisms of Indian monsoon, monsoon circulation, monsoon break, role of physiography on rainfall distribution; EL Nino, La Nina and ENSO **to provide Skill and entrepreneurship**

UNIT IV


Weather and climate. Climatic elements and their diurnal, seasonal and annual variation; climatic classification-Koppen, Thornthwaite, Gaussen and Emberger systems, etc. **to provide Skill and entrepreneurship**

UNIT V

Agroclimatic zones and agro-ecological regions of India; climatology of India principal weather phenomena occurring in four seasons of India; western disturbances, Nor'wester, heat and cold waves **to provide Skill and entrepreneurship**

Course Outcomes:

Students completing this course will be able to:


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CO1: Understand the basic concepts of Air masses and their properties: source regions, processes determining the characteristics of air masses, properties of air masses, classification of air masses, **for skill development.**

CO2: Define the importance of Water vapour or humidity in the atmosphere-various humidity parameters: vapour pressure, specific humidity, relative humidity, mixing ratio, absolute humidity, dew point, wet bulb temperature **to provide skill, employability and entrepreneurship.**

CO3: Understand the Effects of earth's rotation on zonal distribution of radiation, rainfall, temperature and wind **knowledge for better employability in industry.**

CO4: Understand the importance of Weather and climate. Climatic elements and their diurnal, seasonal and annual variation; climatic classification-Koppen, Thornthwaite, Gaussen and Emberger systems, etc. **for provide employability and entrepreneurship.**

CO5: Understand the concept of Agroclimatic zones and agro-ecological regions of India **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Barry RG & Richard JC. 2003. Atmosphere, Weather and Climate. Taylor & Francis Group.
2. Bishnoi OP. 2007. Principles of Agricultural Meteorology. Oxford Book Co.
3. Ghadekar SR. 2001. Meteorology. Agromet Publ.
4. McIlveen R. 1992. Fundamentals of Weather and Climate. Chapman & Hall.

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5. Petterson S. 1958. Introduction to Meteorology. McGraw Hill.
6. Trewartha Glenn T. 1954. An Introduction to Climate. McGraw Hill

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MAS-203 (I) Principles and Practices Organic Farming L:T:P : 3:1:0

Unit I

Organic farming - concept and definition, its relevance to India and global agriculture **for skill development.**

Unit II

Soil and Water management, tillage systems, Making of vermin-compost, green manures and bio fertilizers **for better skilling of employability and entrepreneurship.**

Unit III

Farming systems, crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity **for entrepreneurship development.**

Unit IV

Control of weeds, diseases and insect pest management, biological agents and pheromones, bio pesticides **for better skilling of employability.**

Unit V

Quality standards, inspection, certification and labelling and accreditation procedures for farm produce from organic farms; marketing and export potential: inspection **for skill development and employability.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Organic farming - concept and definition, its relevance to India and global agriculture **for skill development.**

CO2: Define the importance of Soil and Water management, tillage systems, Making of vermin-compost, green manures and bio fertilizers **to provide skill, employability and entrepreneurship.**

CO3: Understand Farming systems, crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity **knowledge for better employability in industry.**

CO4: Understand the importance of Control of weeds, diseases and insect pest management, biological agents and pheromones, bio pesticides **for provide employability and entrepreneurship.**

CO5: Understand the concept of Quality standards, inspection, certification and labelling and accreditation procedures for farm produce from organic farms; marketing and export potential **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1

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CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

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1. Ananthkrishnan, T.N. (Ed.). 1992. Emerging Trends in Biological Control of Phytogamous Insects. Oxford & IBH.
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- <https://iasri.icar.gov.in>

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MAS – 203 (II) Medicinal, Aromatic and Under-Utilized Crops L:T:P : 3:1:0

Unit I

Importance of medicinal and aromatic plants in human health, national economy and related industries **for skill development and entrepreneurship.**

Unit I

Classification of medicinal and aromatic plants according to botanical characteristics and uses; Quality characters in medicinal and aromatic plants **for better skilling of employability.**

Unit II

Climate and soil requirements; cultural practices; yield and important constituents of medicinal plants (Isabgol, Rauwolfia, Poppy, *Aloe-vera*, Satavar, Stevia, SafedMusli, Kalmegh, Asaphoetida, *Nux vomica*, Rosadleetc) **for entrepreneurship.**

Unit III

Climate and soil requirements; cultural practices; yield and important constituents of aromatic plants (Citronella, Palmarosa, Mentha, Basil, Lemon grass, Rose, Patchouli, Geranium etc) **for entrepreneurship.**

Unit IV

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) **for entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:


CO6: Understand the basic concepts of Air masses and their properties: source regions, processes determining the characteristics of air masses, properties of air masses, classification of air masses, **for skill development.**

CO7: Define the importance of Water vapour or humidity in the atmosphere-various humidity parameters: vapour pressure, specific humidity, relative humidity, mixing ratio, absolute humidity, dew point, wet bulb temperature **to provide skill, employability and entrepreneurship.**

CO8: Understand the Effects of earth's rotation on zonal distribution of radiation, rainfall, temperature and wind **knowledge for better employability in industry.**

CO9: Understand the importance of Weather and climate. Climatic elements and their diurnal, seasonal and annual variation; climatic classification-Koppen, Thornthwaite, Gausson and Emberger systems, etc. **for provide employability and entrepreneurship.**

CO10: Understand the concept of Agroclimatic zones and agro-ecological regions of India **for skill development.**


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PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

1. Chadha, K.L. & Gupta, R. 1995. Advances in Horticulture. Vol. II. Medicinal and Aromatic Plants. Malhotra Publ.
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4. Hussain, A. 1984. Essential Oil Plants and their Cultivation. CIMAP, Lucknow.
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MAS 203III Agronomy of Major Cereals and Pulses L: T: P 3:1:0

Objectives: To Knowledge and concept of different techniques of crop production. Basics of crop growth in relation to environment and sustainability.

Study the origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, water management, weed management, nutrient management, plant protection measures and yield.

UNIT- I

Wheat and Rice

UNIT- II

Barley, Oat, maize,

UNIT -III

Kharif sorghum, pearl millet and minor millets.

UNIT- IV

Gram, Lentil and Field Pea

UNIT- V

Pigeonpea, mungbean, urdbean and cowpea.

Course Outcomes:

Students completing this course will be able to:

CO1: To have knowledge about the staple food crops and their cultivation practices with post-harvest technologies

CO 2: To assess a nature of the farm site and develop a new cropping system with the available resources.

CO 3: To understand recent crop management practices on crop productivity and resource use efficiency.

CO 4: To gain knowledge about the recent trends in cultivation of crops.

CO 5: To construct post harvest management practices and value addition.

PO-CO Mapping

Note: 3= highly correlated, 2= moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
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CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

Reference:

1. Principles of Agronomy - T. Y. Reddy and G.H. Sankar Reddi, Kalyani Publishers (2015)
2. Principles of Agronomy - S. R. Reddy, Kalyani Publishers (2016)
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MAS-203IV

Bio-fortification in Cereals L: T: P 3:1:0

Objective: To impart knowledge on the concept, achievements and techniques of biofortification **for skill development, employability and entrepreneurship.**

UNIT-I

Biofortification- concept need and advantages, Historical development of biofortification in crop plants, future prospects and limitations. **for skill development.**

UNIT-II

Malnutrition-A hidden hunger, causes of malnutrition and its impact on human health; micronutrients and vitamins deficient in cereals. **to provide employability and entrepreneurship.**

UNIT-III

Nutritional security, supportive policies, target crops, techniques of biofortification. **to impart knowledge for better employability in industry.**

UNIT-IV

Golden Rice-Consumer acceptability, bioavailability and efficacy. **for provide employability and entrepreneurship.**

UNIT-V

Research on biofortification and achievements in wheat, maize, rice and barley. **for skill development.**

Course Outcomes:

Students completing this course will be able to:

CO1: Students will understand the concept and future of biofortification in cereals **for skill development.**

CO2: To know the malnutrition and nutrients deficiency in cereals **to provide employability and entrepreneurship.**

CO3: Understand the techniques of biofortification. **knowledge for better employability in industry.**

CO4: Provide knowledge of golden rice **for provide employability and entrepreneurship.**

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CO5: Understand the research on biofortification and achievements in cereals **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Shiv Kumar, Harsh Kumar Dikshit, GyanPrakash Mishra, Akanksha Singh. 2022. Biofortification of Staple Crops. Springer Link.
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- <https://www.vedantu.com/biology/biofortification>
- <https://www.iastoppers.com/articles/biofortified-crops-in-india>



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MAS203V

Recent Trend in Crop Growth and Productivity L: T: P 3:1:0

Objective: To study about recent trend crop growth and practices this aims at improving the overall efficiency of growth

UNIT I

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams **to provide Skill and entrepreneurship**

UNIT II

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis **to provide skill, employability and entrepreneurship.**

UNIT III

Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance **to provide skill, employability and entrepreneurship.**

UNIT IV

Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop Weather Calendars and forewarning model; Preparation of agro-advisory bulletin based on weather forecast **to provide skill, employability and entrepreneurship.**

UNIT V

Use of crop simulation model for preparation of Agro-advisory and its effective dissemination **to provide skill, employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of System Approach for representing soil-plant-atmospheric continuum, system boundaries **for skill development.**

CO2: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship.**

CO3: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO4: Understand the importance of weed management in agriculture and also about advantages and disadvantages of herbicide usage **for provide employability and entrepreneurship.**

CO5: Understand Use of crop simulation model for preparation of Agro-advisory and its effective dissemination **for skill development.**


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PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Applied Agroclimatology by O.P.Bishnoi, Oxford Book Company, Jaipur, India302108, Edition 2010.
2. Working with Dynamic crop models, Evaluation, Analysis, Parametrization and Applications by D. Wallach, D. Makowshi, J. W. Jones, Elsevier Oxford U.K, First edition 2006.
3. Remote Sensing Techniques in Agriculture by D.D.Sahoo, R.M.Solanki, Agrobios (India), Jodhpur, 2008.
4. Compendium on Crop Moddeling,by M.C. Varshneya and S.S.Salunke. A short Term Training Programme organized by Centre of Advance Studies in Agril. Meteorology, College of Agriculture, Pune-411005 during 14th Sep., - 12th Oct., 1998, Published by MPKV, Rahuri MPKV/EDN./PUB No. 10(99).
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MAS203VI

Crop Production and System Modelling

L: T: P 3:1:0

Objective: To study about crop production principles and practices and it's modelling

UNIT I

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis **to provide skill, and entrepreneurship**

UNIT II

Use of crop simulation model for preparation of Agro-advisory and its effective dissemination. **to provide skill, employability**

UNIT III

Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance **to provide skill, employability and entrepreneurship**

UNIT IV

Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop Weather Calendars and forewarning model; Preparation of agro-advisory bulletin based on weather forecast **to provide skill, and entrepreneurship**

UNIT V

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams **to provide skill.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the Evaluation of crop responses to weather elements; Elementary crop growth models **for skill development.**

CO2: Define the importance of Use of crop simulation model for preparation of Agro-advisory and its effective dissemination **to provide employability and entrepreneurship.**

CO3: Understand the Potential and achievable crop production- concept and modeling techniques for their estimation **knowledge for better employability in industry.**

CO4: Understand the importance of Weather forecasting, types, methods, tools & techniques **for provide employability and entrepreneurship.**

CO5: Understand the concept of System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques **for skill development.**

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PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

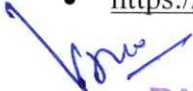
	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Database Management Systems by R. Ramkrishnan, Johannes Gehrke, M.C. Grawhill Education (India) Pvt.Ltd, New Delhi, Indian Edition 2014.
2. Remote Sensing Techniques in Agriculture by D.D. Sahoo, R.M. Solanki, Agrobios (India), Jodhpur, 2008.
3. Compendium on Crop Modelling, by M.C. Varshneya and S.S. Salunke. A short Term Training Programme organized by Centre of Advance Studies in Agril. Meteorology, College of Agriculture, Pune-411005 during 14th Sep., - 12th Oct., 1998, Published by MPKV, Rahuri MPKV/EDN./PUB No. 10(99).
4. Applied Agro climatology by O.P. Bishnoi, Oxford Book Company, Jaipur, India302108, Edition 2010.
5. Working with Dynamic crop models, Evaluation, Analysis, Parametrization and Applications by D. Wallach, D. Makowshi, J. W. Jones, Elsevier Oxford U.K, First edition 2006.

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MAS203VII

Diagnosis of Nutritional Deficiencies in

L: T: P 3:1:0

Field Crop and Their Remedial Measures

Objective: To study about Diagnosis of Nutritional Deficiencies Field Crop principles and practices which aims at improving the overall efficiency of agriculture **and improve the skill, employability and entrepreneurship.**

UNIT I

Origin, geographical distribution, economic importance of soil to **improve the skill**

UNIT II

Soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals – wheat and barley **knowledge for better employability in industry.**

UNIT III

Rabi Sorghum and maize, pulses-chickpea, lentil, peas, French bean oilseeds-rapeseed, mustard and sunflower; Safflower, linseed **for skill development.**

UNIT IV

Sugar crops- sugarcane; Sugar beet, medicinal and aromatic crops- mentha, lemon grass and citronella **for provide employability and entrepreneurship.**

UNIT V

Forage crops-berseem, Lucerne, oat, maize and sorghum and other crops –Tobacco and sweet potato **to provide employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of Origin, geographical distribution, economic importance of soil **for skill development.**

CO2: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship.**

CO3: Understand the Soil and climatic requirements, varieties, cultural practices and yield of Rabi crops **knowledge for better employability in industry.**

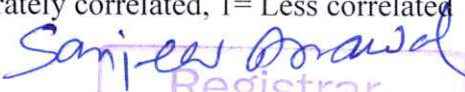
CO4: Understand the Cultivation of sugar crops **for provide employability and entrepreneurship.**

CO5: Understand the concept of plant growth and development and Understand the Cultivation of Forage crops-berseem, Lucerne, oat, maize and sorghum and other crops **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


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	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Modern technique of raising field crops by Chidda singh
2. Agronomy of field crop by S.R. Reddy
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MAS203VIII

Recent Trends in Weed Management

L: T: P 3:1:0

Objective: To familiarize the students about the weeds, herbicides and methods of weed control **and improve the skill, employability and entrepreneurship.**

UNIT I

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds **to provide employability and entrepreneurship.**

UNIT II

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management **knowledge for better employability in industry.**

UNIT III

Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture **for skill development.**

UNIT IV

Herbicide compatibility with agro-chemicals and their application **knowledge for better employability in industry.**

UNIT V

Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management **for skill development.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem **for skill development.**

CO2: Define the importance and Herbicide classification **to provide employability and entrepreneurship.**

CO3: Understand the Bio-herbicides and their application in agriculture **knowledge for better employability in industry.**

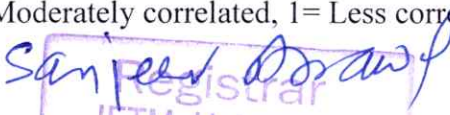
CO4: Understand the importance and Herbicide compatibility with agro-chemicals **for provide employability and entrepreneurship.**

CO5: Understand the concept of Integration of herbicides with non chemical methods of weed management **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


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	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Aldrich, R.J. and Kramer R.J. (1997), Principles in Weed Management.
2. Gupta O.P. (2007), Weed management Principles and Practices.
3. Gupta, O.P. (2008), Modern Weed Management
4. Gupta, O.P. 1984. Scientific Weed Management Today and Tomorrows.
5. Jayakumar, R. and Jagannathan, R. (2007). Weed Science Principles.
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MAS-303 (I) Dryland Farming & Watershed Management L:T:P : 3:1:0

Unit - I

Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture **for skill development.**

Unit - II

Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions **for better skilling of employability.**

Unit - III

Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; midcontingent plan for aberrant weather conditions **for better skilling of employability.**

Unit - IV

Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); anti-transpirants; soil and crop management techniques, seeding and efficient fertilizer use **for better skilling of employability and entrepreneurship.**

Unit - V

Concept of watershed resource management, problems, approach and components **for entrepreneurship development.**

Course Outcomes:

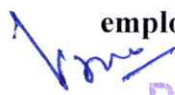
Students completing this course will be able to:

CO6: Understand the basic concepts of Earth and its atmosphere in relation to sun and seasons **for skill development.**

CO7: Understand Temperature in the atmosphere: distribution of temperature in time and space, variation in temperature with height **to provide employability and entrepreneurship**

CO8: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO9: Understand the importance of Concepts of specific heats at constant volume and pressure; first and second laws of thermodynamics and their applications to atmosphere; vertical stability of atmosphere, virtual temperature and potential temperature **for provide employability and entrepreneurship.**


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CO10: Understand the concept of Meteorological temperatures: dew point temperature, wet bulb temperature, equivalent temperature and equivalent potential temperature; thermodynamic diagrams and their uses; **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

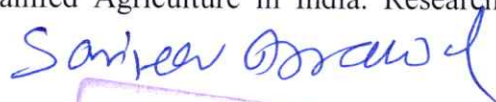
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References

1. Das NR. 2007. Tillage and Crop Production. Scientific Publishers.
2. Dhopte AM. 2002. Agrotechnology for Dryland Farming. Scientific Publ.
3. Dhruv Narayan VV. 2002. Soil and Water Conservation Research in India. ICAR.
4. Gupta US. (Ed.). 1995. Production and Improvements of Crops for Drylands. Oxford IBH.
5. Katyaj JC & Farrington J. 1995. Research for Rainfed Farming. CRIDA.
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MAS-303 (II) Soil Conservation and Watershed Management L:T:P : 3:1:0

Unit I

Soil erosion: Definition, nature and extent of erosion, types of erosion, mechanism of water and wind erosion, effects of soil erosion and factors affecting soil erosion **for skill development.**

Unit II

Soil Conservation: Definition, methods of soil conservation, agronomic measures-contour farming, strip farming, cover cropping, lay farming, alley cropping, mixed cropping, vegetative barriers, mulching and residue management, improved dry farming practices; mechanical measures - bunding, land leveling, contour trenching, terracing, and gully control. Role of grasses and pastures in soil conservation. Wind breaks and shelter belts **for better skilling of employability and entrepreneurship.**

Unit III

Water shed Management: Definition, objectives, concepts, principles, components, problems, steps in implementation of watershed, development of cropping systems for watershed area **for employment and entrepreneurship.**

Unit IV

Land use capabilities, classification, alternative land use systems, agro forestry – Jhum management –basic concepts, socio- ethic aspects, rehabilitation of abandoned Jhum lands **for skill up of entrepreneurship.**

Unit V

Drainage considerations and agronomic management **better skilling of employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO11: Understand the basic concepts of Earth and its atmosphere in relation to sun and seasons **for skill development.**

CO12: Understand Temperature in the atmosphere: distribution of temperature in time and space, variation in temperature with height **to provide employability and entrepreneurship**

CO13: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO14: Understand the importance of Concepts of specific heats at constant volume and pressure; first and second laws of thermodynamics and their applications to atmosphere; vertical stability of atmosphere, virtual temperature and potential temperature **for provide employability and entrepreneurship.**

CO15: Understand the concept of Meteorological temperatures: dew point temperature, wet bulb temperature, equivalent temperature and equivalent potential temperature; thermodynamic diagrams and their uses; **for skill development.**

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PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Arakeri HR & Roy D. 1984. *Principles of Soil Conservation and Water Management*. Oxford & IBH.
2. Dhruvanarayana VV. 1993. *Soil and Water Conservation Research in India*. ICAR.
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MAS-303 III

Agrostology and Agro-Forestry

L:T:P : 3:1:0

Objective: To impart knowledge on the concept of agrostology and agroforestry as a sustainable land for under standing the stand growth, development and provide knowledge regarding the production and protection benefits from the forests to society and environment **for skill development, employability and entrepreneurship.**

UNIT-I

The Grasses: An Overview, economic importance, Classification of grasses and their relatives, Basis of Modern Systems, cultivation fodder and forage grasses in forests, Grasslands of the World **for skill development.**

UNIT-II

Introduction to forestry, important taxa in agro-forestry, characteristics and types of tropical and subtropical forests, management of forest ecosystems and the problems therein; plantation forestry: beginnings, expansion and current status **to provide employability and entrepreneurship.**

UNIT-III

Agroforestry: objectives, importance, potentials and limitations for implementations. Land capability classification and land evaluation. Basis of classification of agroforestry systems and principles, indigenous vs. exotic, intra specific variations, crown architecture of tropical/ temperate trees. Ideotype concept for selection of multipurpose trees and nitrogen fixing trees **to impart knowledge for better employability in industry.**

UNIT-IV

Structural and functional attributes of agroforestry systems, shifting cultivation, taungya system; multiple and mixed cropping, alley cropping, silvopastoral systems, shelter-belts and windbreaks, energy plantations and home gardens **for provide employability and entrepreneurship.**

UNIT-V

Role of trees in soil productivity and conservation– micro-site enrichment- litter and fine root dynamics, Nitrogen fixation and nutrient pumping. Soil productivity and management in agroforestry. Community forestry and social forestry, linear strip plantations. Climate Change mitigation and adaptation through agroforestry **for skill development.**

Course Outcomes:

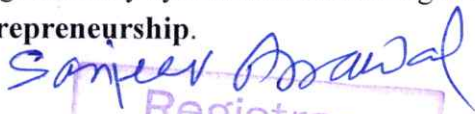
Students completing this course will be able to:

CO1: Students will get basic idea about agrostology and agro-forestry **for skill development.**

CO2: Provide knowledge of classification, structural and functional attributes of agroforestry systems, different agroforestry systems diversified agro-ecological regions **to provide employability and entrepreneurship.**


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CO3: Understand the management of ecosystem in Agroforestry **knowledge for better employability in industry.**

CO4: Provide knowledge for planting of different woody and non-woody plants to integrate with crop and forest plants **for provide employability and entrepreneurship.**

CO5: Understand the land conservation, micro-site enrichment and maintaining soil productivity by growing nitrogen fixing trees **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

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MAS-303 IV

Agronomy of Commercial Crops

L:T:P : 3:1:0

Objective: To understand the basic knowledge about commercial crops and concept of growing practices from sowing to harvesting and more for post-harvest handling and uses until sold. **for skill development, employability and entrepreneurship.**

Origin, geographic distribution, economic importance, soil and climatic requirement , varieties, cultural practices, harvest and post-harvest handling, and value addition of major cereals, pulses, oil seeds, and tubers and forage crops etc..

UNIT-I

Cereals & Sugar crops: Rice, wheat, maize, sugarcane and sugar beet **for skill development and employability.**

UNIT-II

Pulses: Chick pea, cowpea, black gram, green gram, red gram, horse gram, lentil, french bean, peas, other minor pulses **for skill development and entrepreneurship.**

UNIT-III

Oilseeds: Groundnut, sesamum, soya bean, rapeseed and mustard, sunflower, safflower, linseed, other minor oilseeds **to provide employability and entrepreneurship.**

UNIT-IV

Forage and Fibre crops: Napier, para grass, fodder maize, fodder sorghum, fodder bajra, fodder cowpea, berseem, lucerne. Grasslands and pastures – grazing systems - Hay and silage making; Cotton, jute, other minor fibre crops **for for skill development.**

UNIT-V

Tuber crops: Cassava, potato, sweet potato, yams, minor tuber crops **to provide employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

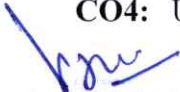
Students will get basic idea about agrostology and agro-forestry **for skill development.**

CO1: Understand the production technology of cereals and sugar crops **to provide employability and entrepreneurship.**

CO2: Understand the management of production practices of various pulse crops **knowledge for better employability in industry.**

CO3: Provide knowledge for of oil seed crops of industrial use for extraction of edible oil. **for provide employability and entrepreneurship.**

CO4: Understand growing of forage and fibre crops **for skill development.**


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CO5: Understanding the agronomic practices for growing tuber crops needed in food industry use **to provide employability and entrepreneurship.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

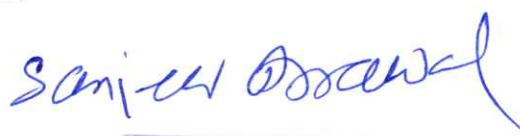
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MAS 303V

STRESS CROP PRODUCTION L:T:P : 3:1:0

Objective: To study various types of stresses in crop production and strategies to overcome them.

UNIT I

Stress and strain terminology; nature and stress injury and resistance; causes of stress. Low temperature stress: freezing injury and resistance in plants, measurement of freezing tolerance, chilling injury and resistance in plants, practical ways to overcome the effect of low temperature stress through, soil and crop manipulations.

UNIT II

High temperature or heat stress: meaning of heat stress, heat injury and resistance in plants, practical ways to overcome the effect of heat stress through soil and crop manipulations. Water deficit stress: meaning of plant water deficient stress and its effect on growth and development, water deficit injury and resistance, practical ways to overcome effect of water deficit stress through soil and crop, manipulations.

UNIT III

Excess water or flooding stress: meaning of excess water stress, its kinds and effects on crop plants, excess water stress injury and resistance, practical ways to overcome excess water stress through soil and crop manipulations.

UNIT IV

Salt stress: meaning of salt stress and its effect on crop growth, salt stress injury and resistance in plants, practical ways to overcome the effect of salt stress through soil and crop manipulations.

UNIT V

Mechanical impedance of soil and its impact on plant growth; measures to overcome soil mechanical impedance. Environmental pollution: air, soil and water pollution, and their effect on crop growth and quality of produce; ways and means to prevent environmental pollution.

Course outcomes:

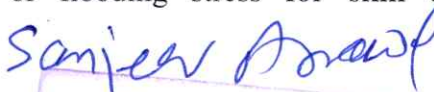
Students completing this course will be able to:

CO1: On successful completion of this course a student will be able to: Understand the Stress and strain terminology **for development of skills.**

CO2: Understand all about the high temperature or heat stress **for development of skill and employability.**

CO3: Understand the Excess water or flooding stress **for skill development and employability.**


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CO4: Understand the Salt stress for skill development and employability.

CO5: Understand the mechanical impedance of soil and its impact on plant growth for skill development, entrepreneurship and employability.

PO-CO Mapping (Please ✓ wherever required)

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	1	1
CO2	3	3	3	1	1
CO3	3	3	3	3	1
CO4	3	3	3	3	1
CO5	3	1	1	1	1

CO-Curriculum Enrichment Mapping (Please ✓ wherever required)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	3

References:

1. Jagadish Rane, Paramjit Singh Minhas, Ratna Kumar Pasala Abiotic Stress Management for Resilient Agriculture, Springer
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MAS303VI

Physiological and Molecular responses
of Plant to Abiotic Stress

L:T:P : 3:1:0

Objective: Objective To acquaint the students about recent advances in agricultural production for skill, employability and entrepreneurship development

UNIT I

Role of Physiological growth parameters in crop productivity **knowledge for better employability in industry.**

UNIT II

Introduction to Crop Physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology **to provide employability and entrepreneurship.**

UNIT III

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants **for skill development.**

UNIT IV

Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses **to provide employability and entrepreneurship.**

UNIT V

Physiological aspects of growth and development of major crops: Growth analysis **for skill development.**

Course Outcomes:

Students completing this course will be able to:

CO6: Understand the basic concepts of field and crop management starting from field preparation, seed sowing, till harvesting and threshing of crop **for skill development.**


CO7: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship.**

CO8: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO9: Understand the importance of weed management in agriculture and also about advantages and disadvantages of herbicide usage **for provide employability and entrepreneurship.**

CO10: Understand the concept of plant growth and development **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)


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Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. A Text Book Plant Physiology* Dr. V. Verma Emkay Publisher, Delhi 110 051
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MAS303VII Advance in Crop Growth and Productivity L:T:P : 3:1:0

Objective: Objective To acquaint the students about recent advances in agricultural production for skill, employability and entrepreneurship development

UNIT I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibers; fodders and cash crops; vegetable and horticultural crops **to provide employability and entrepreneurship.**

UNIT II

Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; important concepts of breeding self pollinated, cross pollinated and vegetative propagated crops **for skill development.**

UNIT III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional) **to provide employability and entrepreneurship.**

UNIT IV

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. **for skill development.**

UNIT V

Ideotype concept and climate resilient crop varieties for future **knowledge for better employability in industry.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of field and crop management starting from field preparation, seed sowing, till harvesting and threshing of crop **for skill development.**

CO2: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship.**

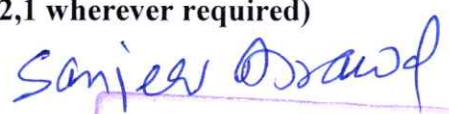
CO3: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO4: Understand the importance of weed management in agriculture and also about advantages and disadvantages of herbicide usage **for provide employability and entrepreneurship.**

CO5: Understand the concept of plant growth and development **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)


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Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Modern technique of raising field crops by Chidda singh
2. Agronomy of field crop by S.R. Reddy
3. Hand book of Agriculture, ICAR New Delhi

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MAS303VIII

Plant Growth Modelling and Simulation

L:T:P : 3:1:0

Objective: **Objective** To acquaint the students about recent advances in agricultural production for skill, employability and entrepreneurship development

UNIT I

Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops **for skill development.**

UNIT II

Ideotype concept and climate resilient crop varieties for future **knowledge for better employability in industry.**

UNIT III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional) **to provide employability and entrepreneurship.**

UNIT IV

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. **for skill development.**

UNIT V

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops **to provide employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of field and crop management starting from field preparation, seed sowing, till harvesting and threshing of crop **for skill development.**

CO2: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship.**

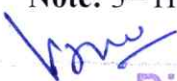
CO1: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

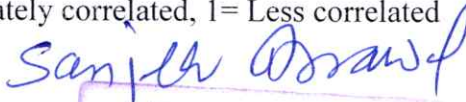
CO2: Understand the importance of weed management in agriculture and also about advantages and disadvantages of herbicide usage **for provide employability and entrepreneurship.**

CO3: Understand the concept of plant growth and development **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated


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	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	1	3
CO2	3	3	1	1	1
CO3	1	1	3	1	1
CO4	2	2	3	2	1
CO5	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Modern technique of raising field crops by Chidda singh
2. Agronomy of field crop by S.R. Reddy
3. Hand book of Agriculture, ICAR New Delhi

Web Sources:

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- <https://tnau.ac.in>
- <https://iasri.icar.gov.in>
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MAS-151

Soil Fertility and Nutrient Management Lab

L:T:P : 0:0:2

List of Experiments:

1. Determination of soil pH, EC, Organic Carbon, Total N, Available N, P, K and S in soils
2. Determination of Total N, P, K and S in plants

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MAS 152

Principles of Plant Physiology Lab

L:T:P : 0:0:2

List of Experiments:

1. Measurement of soil water status: Theory and principle of pressure plate apparatus, neutron probe, Measurement of plant water status: Relative water content, water saturation deficits Chardakov's test.
2. Theory and principle of pressure bomb, psychrometer and osmometer, Measurement of transpiration rate.
3. Measurement of vapour pressure deficits, theory and principle of porometry, diffusion prometer.
4. Steady state porometer, Stomatal physiology, influence of ABA on stomatal closing.
5. Mineral nutrients: Demonstration of energy requirement for ion uptake, Deficiency symptoms of nutrients.

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MAS-251 Principles and Practices of Water Management Lab

L:T:P : 0:0:2

List of Experiments:

1. Measurement of soil water potential by using Tensiometer
2. Soil-moisture characteristics curve
3. Water flow measurements using different devices
4. Determination of irrigation requirements
5. Calculation of irrigation efficiency
6. Determination of infiltration rate
7. Determination of saturated/unsaturated hydraulic conductivity



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MMAG-254

Experimental Statistics Lab

L:T:P: 0:0:2

List of Experiments:

1. Estimation of samples statistic viz. means SD, SE and CV. Z-test, t-test and paired t-test.
2. Comparison of two variances using F-test. Bartlett's test for homogeneity of variances.
3. Chi-square test for test of goodness of fit and homogeneity of ratio test for independence of attributes.
4. Computation of correlation co-efficient and its significance.
5. Fitting of simple linear regression and testing the significance of regression co-efficient.
6. Multiple linear regressions fit and testing Determination of optimum plot size using uniformity trial.
7. Analysis of CRD, RBD and LSD.
8. Analysis of multi-observation data (sampling in RBD) Missing plot technique in RBD with one or two missing values.
9. Analysis of Factorial experiments conducted in RBD Analysis of Split-plot and Split-plot design. Analysis of data with transformations.



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